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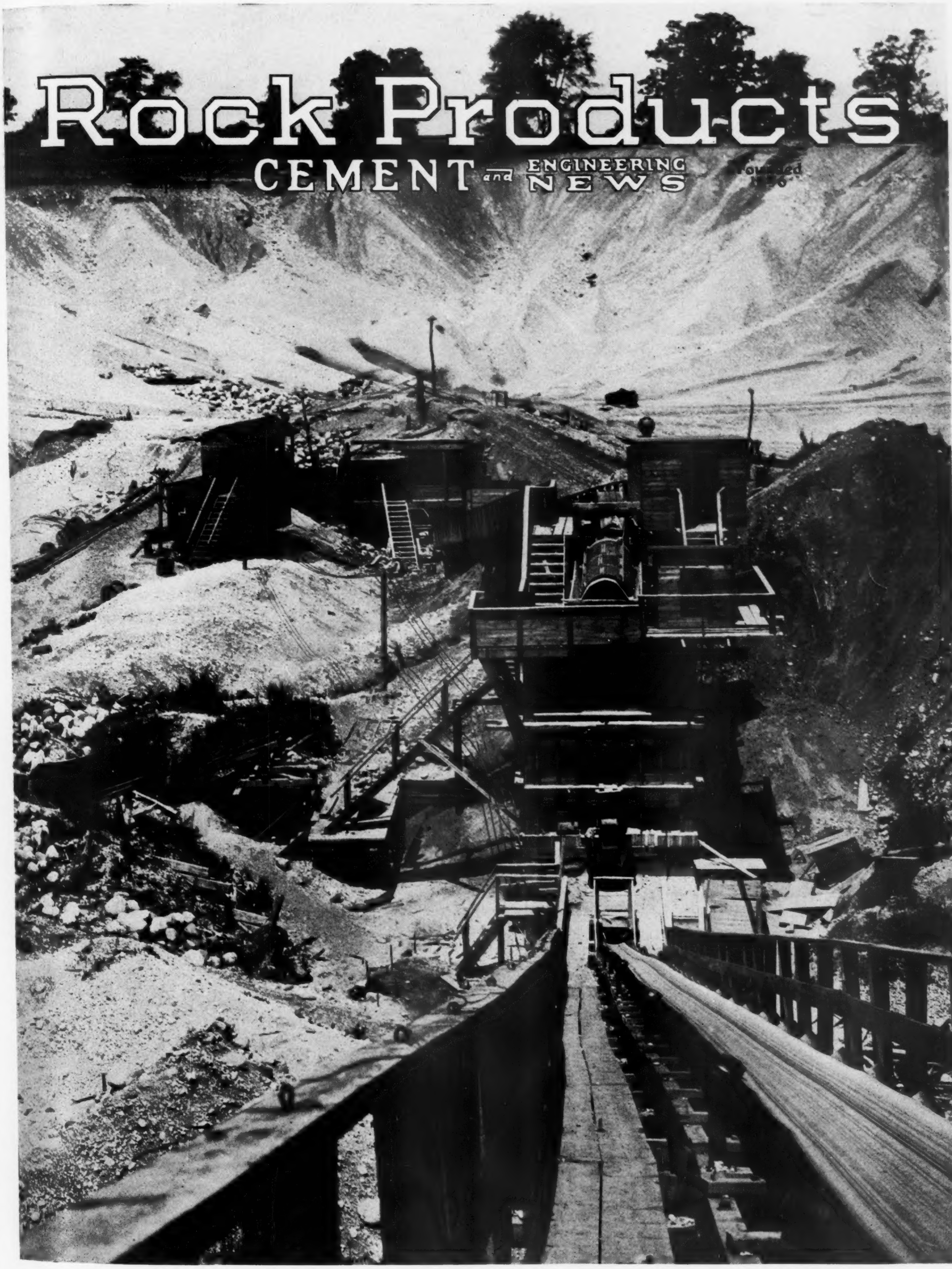


The pit, crushers, and scalping screen at the Kenosha Sand and Gravel Co. plant at Silver Lake, Wis., with the dragline excavator bucket bringing material to the hopper above the primary crusher. A distant hopper and an extension conveyor belt have since been installed in this pit

The plant of the Kenosha Sand and Gravel Co., at Silver Lake, Wis., after recent improvements had been completed. The pit hopper and belt conveyor to the left were added to work a part of the pit not reached before

Sand and Gravel Plants Along the Illinois-Wisconsin State Line

Territory Dotted with Small But Efficient Plants Which Serve the Chicago Area

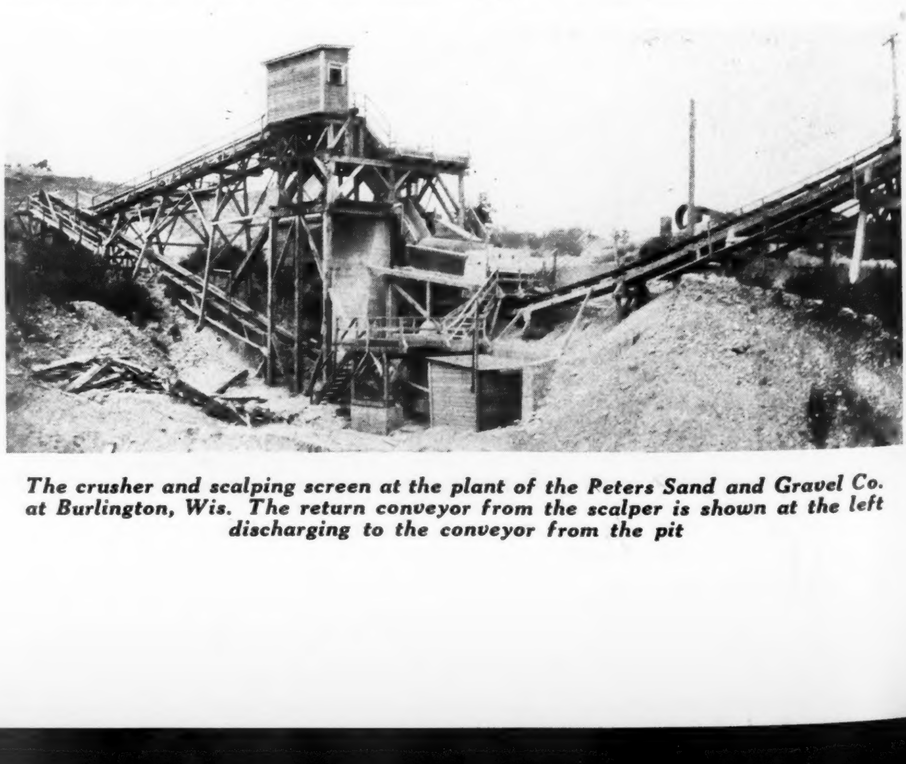
By H. M. Fitch
Associate Editor, Rock Products

FROM Lake Michigan nearly to the Mississippi river along the boundary between Illinois and Wisconsin there is a fertile country which, when the surface is scratched, shows an abundance of good gravel. The moraines of the late Wisconsin glaciation are found throughout the territory with their deposits of coarse gravel which require considerable crushing, while at other points in the territory farther from the moraines the sand is relatively free of boulders and large stones.

Although there are a number of good-sized cities in this territory, the sand produced is more than can be absorbed in the immediate locality, and Chicago is coming to be looked upon as the logical market for this material. Of the dozen plants visited, only one was not shipping at present to the Chicago market, and this one was also contemplating entering that field at an early date. This means that these representative plants of the territory—and unquestionably the others are doing the same thing—are shipping sand anywhere from 80 to 100 miles to get to a market well saturated already. One reason for this condition is the slackening of work on concrete roads in these parts of Wisconsin and Illinois, and particularly in the former state. If this road work builds up again, the situation undoubtedly will be much relieved.

Peters Sand and Gravel Co.

The start of the editorial trip was made at Burlington, Wis., about 10 miles from the state line and 23 miles from Lake Michigan. The plant of the Peters Sand and Gravel Co. was visited at this city. This plant has a capacity of 25 to 30 cars in a 10-hr. day, which is a small operation in comparison to many of the big producing plants of the country, but yet it is as large or larger than the average plants in this territory. With the exception of the Consumers Co. plant at Beloit, which produces about 100 cars each day, all of the plants visited on this trip



The crusher and scalping screen at the plant of the Peters Sand and Gravel Co. at Burlington, Wis. The return conveyor from the scalper is shown at the left discharging to the conveyor from the pit

average between 20 and 40 cars daily, and these plants can be taken as fairly representative of the entire territory.

The material at this operation is handled in the pit by a belt conveyor which was recently installed. Formerly a scraper was employed, but developments in the pit required a different type of operation and the belt conveyor method was decided upon. A Koehring convertible gas shovel loads the material to the 24-in. belt conveyor, which carries it to the hopper formerly used by the scraper. This hopper delivers the material,

At the Peters plant the conveyor from the pit deposits material on a bar grizzley to be separated between the crusher and the scalping screen

by means of a Smith feeder, to another 24-in. belt that elevates it to a 2-in. grizzly above the crusher. The gravel passing the grizzly drops directly to a 48-in. by 12-ft. revolving scalping screen, while the oversize passes to the crusher, which is a No. 5 McCully. The discharge of the crusher also drops to the scalping screen. The rejects from the scalping screen drop to an Allis-Chalmers gyratory reduction crusher. The discharge from this crusher is carried by belt conveyor up to the 24-in. belt conveyor mentioned above, and thus passes over the grizzly and through the scalping screen again in a closed circuit.

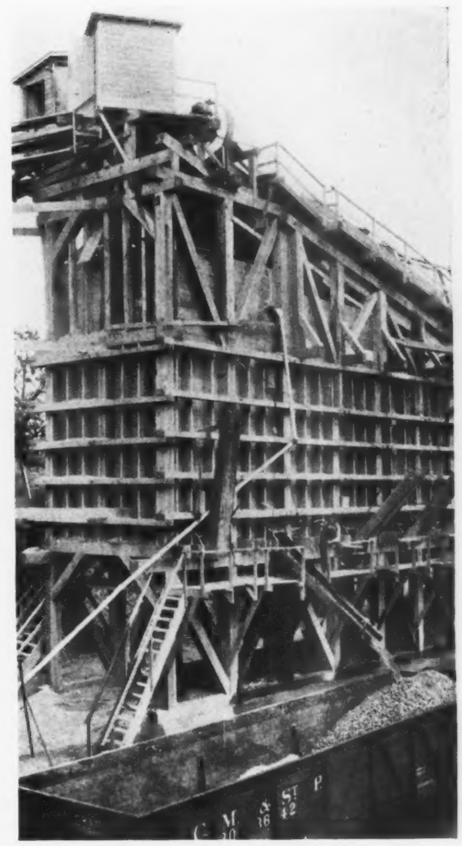
The material passing through the scalping screen is carried by a belt conveyor to the screening and washing plant. The screens used are conical, there being one pair 42-in. by 8-ft. in size, with 1¼-in. openings, one pair 60-in. by 8-ft., with ⅝-in. and ½-in. openings, and two sand screens 72-in. by 8-ft., with ¼-in. holes. Three Toepfer and Sons double screw washers are used for recovering and dewatering the sand, and for the production of mason's sand there is a "Hummer" screen. There are two pumps to supply the plant with water, one pumping from a pond nearby, and the other from a well 98 ft. deep. Both are Allis-Chalmers centrifugal pumps 4x5-in. in size.

The plant is served by both the Milwaukee road and the "Soo" line. Shipping is largely done by rail, the sand going to Milwaukee, Kenosha, Chicago and the surrounding territory, but the company also operates a large trucking business around Burlington. John W. Peters is owner of the company and A. J. Stack is his superintendent. The company also operates a small cement products plant on property adjacent to the gravel plant, using aggregate directly from the latter. This products plant was described in the cement products section of ROCK PRODUCTS in the issue of September 15, 1928.

Kenosha Sand and Gravel Co.

The plant of the Kenosha Sand and Gravel Co. is located at Silver Lake, Wis., some 12 miles south of Burlington. Here is a thoroughly modern operation turning out approximately 1600 yd. in two 8-hr. shifts, or approximately 40 cars a day. At this plant, as at the Peters plant, a belt conveyor method of handling material in the pit is being installed, due to the expansion of the operation. As is shown in one of the illustrations, this conveyor was being constructed at the time the plant was visited but is now in operation. It is a Link-Belt installation. A Sauerman 2½-yd. drag scraper, which formerly brought the material to a hopper above the primary crusher, will be shifted to deliver the material to the new concrete hopper constructed at the outer end of the belt. A 100-hp. motor operates the hoist which handles the drap scraper. The hoist and motor are in a small shed which is built on skids so that it can be moved to a new position and anchored when changes in the pit require it.

There is an overburden from one to one and one-half feet which is removed with two Euclid Crane and Hoist Co. 1-yd.



The washing plant and bins at the Peters plant

scrapers drawn in tandem behind a Cleveland tractor. Blasting is used in the pit to loosen the bank for the drag scraper, since the deposit is firmly compacted.

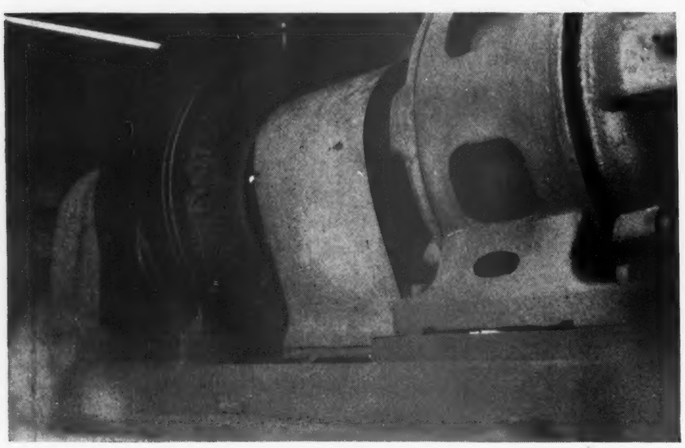
This plant was completed four years ago, replacing an older plant on the same site. The engineering work of the new plant was done by the Smith Engineering Works of Milwaukee, Wis., and the plant is equipped with Telsmith crushers, screens and other equipment throughout.

The belt conveyor from the pit delivers the material to the hopper at the primary crusher, and the material is passed to a bar grizzly by a Telsmith reciprocating feeder. The oversize drops to a Telsmith No. 10

The bins and washing plant of the Kenosha Sand and Gravel Co. at Silver Lake. The bridge to the left carries the waste water flume for discharge on swamp land that is being raised

The pit at the Silver Lake plant as it was while the additional pit conveyor, at the right, was being installed. The bucket is shown still working to the original pit hopper

crusher, the discharge from which joins the undersize from the grizzly on the belt conveyor to the scalping screen. This crusher is driven through a speed reducer by a 50-hp. Northwestern electric motor.



Speed reducer drive and motor for the crusher at the Kenosha Sand and Gravel Co. plant

The scalping screen is 48-in. by 12-ft. driven through a Foote speed reducer. The use of speed reducers instead of belts in this plant is particularly interesting, as it was the pioneer plant in this part of the country to install the reducers, and now has reducers in use at all points where they can be used to replace belts. Robert Bright, the superintendent at the plant, stated that the installation of speed reducers paid for itself within a few years, by cutting down the expense of belts, and the loss of output due to broken belts. He estimated that these expenses during a year would run to about $1600 with the plant operating at normal capacity. All of the reducers installed are Foote equipment, although the one which had just been received for installation with the improvements now being carried on is a Jones reducer.

The rejects of the scalping screen fall to a Telsmith No. 2F secondary crusher. The discharge of this crusher is not taken back to the scalping screen, but drops to the belt conveyor which carries the material to the screening plant, joining the undersize of the scalping screen on this conveyor. The conveyor delivers the material to two 40-in. by 17-ft. sizing and washing screens, having jackets with holes ¼ x 1-in. in size. The holes in the screen section of the screens proper are ¾-in. round and 1½-in. round. A 40-hp. Northwestern motor drives the belt conveyor and also drives the two screens through chain drives and gears, as speed reducers on these drives would not be practical at this point.

Water for washing is supplied by two American centrifugal well pumps through 700 ft. of pipe from the lake, a raise of approximately 80 ft. The waste water is carried over the railroad tracks in a flume, across a small field, over the concrete road and deposited on swamp land owned by the Consumers Co. of Chicago. This property is a part of the land surrounding the Consumers ice house on Silver Lake, and the material in the sand plant waste water is steadily raising the property level so that it is gradually becoming salable lake front land instead of worthless swamp. Since it would be expensive for the Kenosha company to get rid of its waste in any other

Hopper beside the main highway for loading direct to trucks at the Silver Lake plant

Stripping with a tractor pulling two 1-yd. scrapers in tandem at the Silver Lake plant

The new pit hopper at the Kenosha plant, showing the bucket discharging, and, at the left, the hoist house built on skids and here shown resting on a concrete foundation

manner, both companies benefit materially through this arrangement.

The plant is completely electrically operated, and to be certain that no interruption in service may be necessary, the power lines hook up with two main lines, one from South Milwaukee and one from Kilbourne, Wis. Power comes in at 26,000 volts and is stepped down to 440 volts.

Material is shipped out both by truck and by rail, although the larger part goes by the latter means. The railroad is the Chicago and Northwestern. The plant has enough switch track capacity to hold 20 loaded cars and 20 empties. An unusual arrangement has been made for loading trucks which keeps them clear of the plant and also does away with their operation on the grade up to the plant. This is a hopper several hundred feet from the plant and directly beside the concrete road. This hopper is filled by a 20-yd. dump car hauled on standard railroad track by a converted Nash "Quad" truck. This arrangement was described in the "Hints and Helps" section of Rock Products for September 29, 1928. At the plant a Mead-Morrison car puller, operated by 15-hp. motor, is used to haul as many as 20 cars at a time, although the machine was only built to pull three cars, according to Mr. Bright.

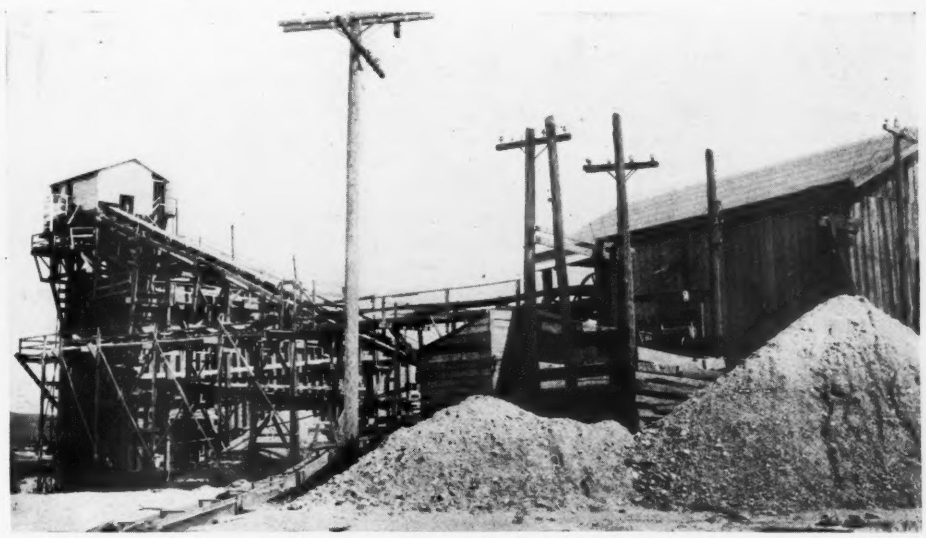
General offices of the company are at Kenosha, Wis.

American Sand and Gravel Co.

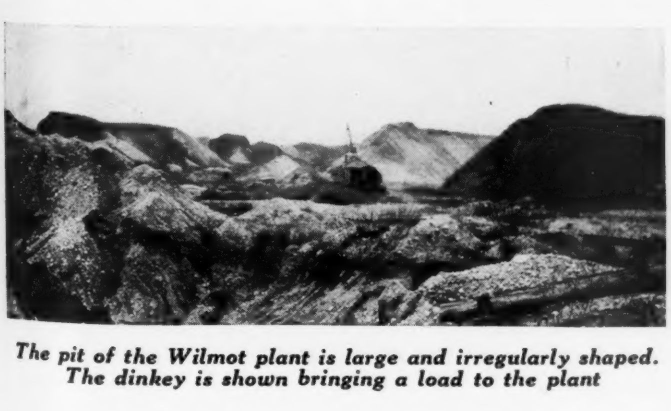
Two plants of the American Sand and Gravel Co. were visited. The first was at Wilmot, Wis., only a short distance from the Kenosha plant. This plant, which turns out 18 or 20 cars per day, is not a new one, although the present owners only acquired it about two years ago. It was formerly operated by the James A. Buckley Gravel Co. of Wilmot and James Buckley, son of the former owner, is the present superintendent.

This plant operates quite a sizeable pit with high steep banks. Loading is done by a Monighan railroad-type steam crane with a clamshell bucket to a 10-yd. hopper-bottom car operating on a standard gage track, and pulled by saddle-back American dinkey. The car is dumped to a track hopper at the plant and the material passes to a conveyor belt that carries it to the scalping screen. The rejects drop to the primary crusher which is a No. 5, made by the Power and Mining Machinery Co. of Milwaukee and driven by a 40-hp. General Electric motor, which also drives the scalping screen. The material passing through the scalping screens, together with the discharge of the crusher, is carried to the screening and washing plant by a Stephens-Adamson belt conveyor.

There are three pairs of screens in the washing plant, and the rejects from the first pair drop to a Link-Belt conveyor which carries them back to the secondary crusher in the crusher house. This is a Gates, driven by Sievert electric motor of 20-hp. The discharge of this drops to the main conveyor and so is returned to the first pair of screens. The screens are of Link-Belt make and have square punched holes. A pair of sand settling tanks follow the third pair of screens. Below the screens are eight wood bins equipped



The washing plant, left, and the crusher house, right, of the Wilmot plant of the American Sand and Gravel Co.



The pit of the Wilmot plant is large and irregularly shaped. The dinkey is shown bringing a load to the plant

The large railroad-type crane digging in the pit of the American plant at Wilmot, Wis.

The plant of the American Sand and Gravel Co. at Wilmot. In the foreground is shown the track hopper and the tank for refilling the dinkey's water tank while the sand car is dumping

with chutes for loading trucks on one side of the plant and railroad cars on the other.

Stock piling is done to the south of the plant, a Moore "Speed Crane" on caterpillar treads, with a Williams bucket, being used for this work. This crane is also used for unloading coal to a concrete bin beside the plant track.

The plant is several hundred yards from the tracks of the "Soo" line, over which shipments are made. Since the grade slopes down to the main line, no car puller need by used at the plant, the gravity system being used instead. Most of the output is shipped out, a large share reaching the Chicago market, but the company also has a large amount of material trucked out for use on highways and for development work on the surrounding lake property.

The plant is electrically operated throughout, the equipment being operated by belt drives. The electricity is purchased.

Fontana Plant

The other plant of the American Sand and Gravel Co., which was visited, is located at Fontana, Wis., on the shore of Lake Geneva, and 25 or 30 miles west of the Wilmot plant. This plant is newer than the one just described, but averages about the same production of 18 to 20 cars daily.

A Bucyrus steam shovel loads the material in the pit to a movable hopper fitted with a bar grizzly above a belt conveyor. This conveyor carries the material to a hopper above the outer end of another belt conveyor which takes it to the plant. The second conveyor is in a semi-permanent position, but the other has to be moved, as the development of the pit requires changes to reach the point to be worked. The combined length of the two conveyors is about 600 ft., and they are of Stephens-Adamson make.

The belt from the pit delivers the gravel to a bar grizzly above the primary crusher, which is an Austin gyratory, driven by a 60-hp. motor. The stones from the grizzly pass to the crusher, while the material passing through goes to a belt which carries it to the scalping screen. The crusher discharge also falls to this same belt. Rejects from the scalping screen drop to an Austin gyratory secondary crusher driven by a 75-hp. motor. The discharge of this passes to a second revolving screen and the rejects of the second screen are raised by a bucket elevator to the secondary crusher again, thus completing a closed circuit.

The material passing through the first screen goes downward by an inclined belt elevator to the hopper beneath the second screen. The material passing through the latter also drops to this hopper. The first screen has round punched plate holes, while the other has square punched plate holes. The second screen also has a plate containing small holes for pea gravel. This material is separated here, and falls to a separate hopper, from which it is raised to a small storage pile by a 6-in. bucket elevator.

All of the material, except the pea gravel mentioned above, is picked up by an 18-in. bucket elevator and raised to the screening and washing plant. This elevator, together with all of the sizing screens, is driven by a 35-hp. motor. There are three pairs of sizing screens, the first having 1¼-in. square punch plate holes, the second having ¾-in. square holes and the last with ¼-in. square holes. Below the final pair of screens are two home-made sand settling tanks. The plant produces gravel in sizes designated by the Wisconsin State Highway Department as No. 9, No. 8 and No. 5 (pea gravel) as well as sand. Water is supplied for washing from a deep well on the property by a centrifugal pump operated by a General Electric motor. The whole plant is electrically operated.

Beneath the screens are four circular monolithic concrete silos. These have chutes on either side for loading cars at one side and trucks at the other. The gravity system for switching cars is used, the slope being sufficient down to the line of the Chicago, Harvard and Geneva Lake railroad, an electric line over which the plant ships. Because of the large summer home developments around Lake Geneva there is considerable truck shipping from this plant as well as shipping by rail.

The company has a fortunate way of getting rid of its large boulders in its pit. The deposit has quite a number of these larger stones which are thrown off the bar grizzly at the shovel and are picked up by builders of summer homes nearby, for use in fireplaces and for foundations. Some stripping is required in the pit, and this is done with the same shovel that does the loading during the off season.

The main offices of the company are at Chicago. Claude Stephenson is the superintendent at the Fontana plant.

Wisconsin Wilcox Company

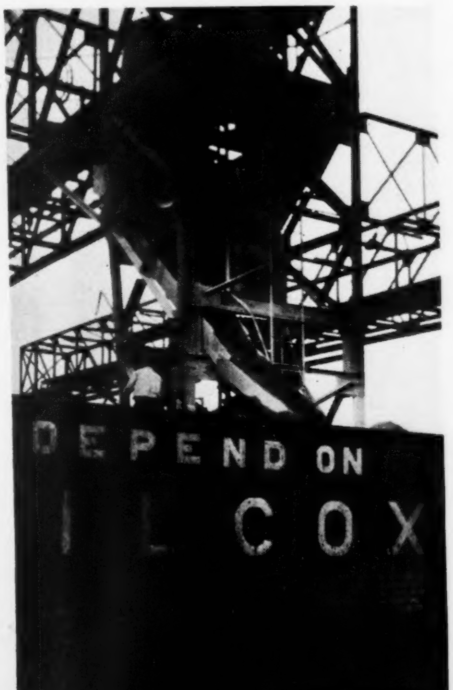
One of the most interesting plants visited on the trip was that of the Wisconsin Wilcox Co. near Avalon, Wis., some miles west of Fontana. This is a dredging operation turning out about 40 cars per day and shipping very nearly all of its output since there is no

The plant of the American Sand and Gravel Co. at Fontana. To the left are the washing plant and concrete bins, and behind to the right is the crusher building

The plant of the Wisconsin Wilcox Co. near Avalon, showing the three trusses over the stock piles

large market available near the plant. The plant is five years old, but is thoroughly modern, well-constructed and is stated to be quite efficient. The particular unusual feature of this plant is the use of a tunnel system under storage piles, instead of the usual storage bins or silos.

While much of the deposit is on high ground, well above the little river that flows a short distance from the plant, the good



Loading a car through chutes from the overhead conveyors at the Avalon plant

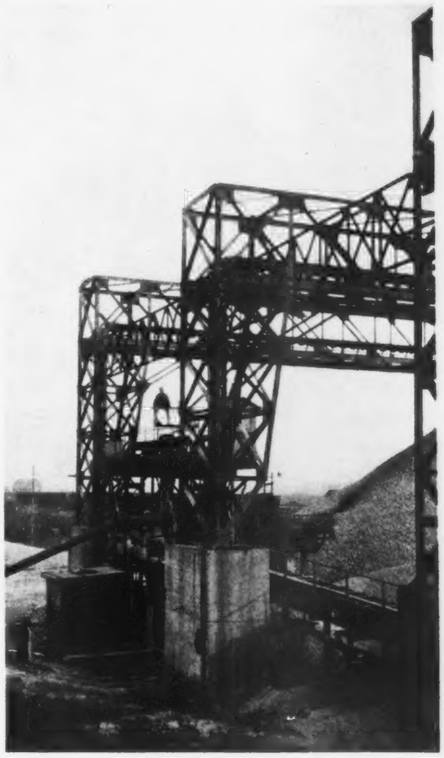
gravel extends down to a considerable depth. For this reason a dredging operation was the most logical one to use, and the company has already opened up two ponds on the adjacent property. The first pond, which is no longer being worked, is now being used as a settling basin for the waste water from the plant. This pond is kept a few feet higher than the second pond by means of a dam, over which the excess water flows to the lower pond, after the silt and fine sand has settled out. This use of the upper pond for settling prevents the continual circulation of the silt through the plant, and allows the pumping of more material of value. Both ponds have banks 20 to 40 ft. in height at present.

From 5 to 10 ft. of stripping is necessary over the deposit, and this is done by a Bucyrus 50-B electric shovel. The material is loaded to trucks and taken to the bank of the old pond into which it is dumped.

The dredge is of wood and is supported on two steel pontoons running longitudinally. It is 18x30 ft. in size. The equipment within the dredge consists of a Bennett centrifugal pump operated by a 250-hp. Allis-Chalmers motor. The intake is fitted with a "Swinteck" cutter. The discharge line to the plant is of 12-in. iron pipe, supported on pontoons made of steel barrels.

When bank caving is necessary, gravel is washed down with water furnished by a high pressure centrifugal pump, which is driven by a 40-hp. Allis-Chalmers motor. This unit is easily cared for and takes the place of one or more men for the purpose of caving the bank. It also has the advantage of not only bringing the gravel to the dredge boat, but also of removing the silt from it in the process, so that it is practically washed before it even leaves the pond, according to H. J. Brown, the superintendent at the plant.

The plant itself is a structure of steel and



The crushing and screening end of the Wilcox plant, where the dredge discharge enters through the pipe showing to the left

concrete, consisting chiefly of three parallel tunnels, with a structural steel truss above each one, over which the conveyors are carried. The tunnels are 7 ft. wide, 6 ft. high and 150 ft. long, and are constructed of reinforced concrete. The steel trusses are also 150 ft. long and rise about 50 ft. above

The two dredging ponds of the Wisconsin Wilcox Co. showing the dam which prevents silt from washing back to the pond which is now being worked

the top of the tunnels. The bottom 15 ft. of the end columns are for the foundations and are of reinforced concrete constructed monolithically with the tunnels. The conveyors used are the pivoted bucket type on chains which make a continuous circle through the tunnel up one end column, across the top and down at the other end.

The pipe from the dredge discharges to a triple-deck Chapman screen at the plant. The holes in the three decks of this are ¼-in., 1¼-in. and 2-in., respectively, and are all punched square. The rejects of this screen drop directly to a Worthington gyratory crusher below the screen. The stone passing the 2-in. holes and retained on the 1¼-in. holes is designated as No. 9, by the Wisconsin State Highway Department, while the stone passing the 1¼-in. holes is designated as No. 8. These two sizes are carried by chutes to two circular upright steel boxes, or hoppers, above the east and middle tunnels respectively, and from these hoppers the stone is fed down to the buckets passing beneath. The fine material and water which passes through the ¼-in. screen is carried by a wooden flume to a sand settling box over the west tunnel. The settled sand drops down to the buckets in the tunnel, while the waste water flows off to the upper dredge pond, as mentioned before. The triple deck screen is operated by a 20-hp. General Electric motor equipped with automatic compensation for high and low speeds.

The material from the crusher is returned directly to the pump discharge just at the screen by a small bucket conveyor, similar to the large conveyors. This conveyor is operated by a 10-hp. General Electric motor, while the crusher is run by a 50-hp. General Electric motor.

The three large conveyors take the stone and sand as it is delivered from the screen and carry it up to and across the top trusses where the buckets are tripped at any desired point for stock piling. Lateral chutes have been added to spread the material out somewhat. Reclaiming is done through gates in the roofs of the tunnels under the stock piles, the same conveyors taking the material up to the cars. The company's side track runs along the opposite end of the trusses from the screen and crusher. The buckets as they reach the top at this end are tripped to chutes leading directly to cars on the siding. All the conveying equipment at this plant was furnished by the Link-Belt Co. of Chicago. The conveyors are driven by 15- and 30-hp., two speed motors.

The Wisconsin Wilcox Co. maintains a well-equipped repair shop at its plant, the equipment including a 300-amp. portable Lincoln welder, for which Mr. Brown, the superintendent, says he finds plenty of use. The company has a garage on the property for its trucks, and there is also an up-to-date office building.

This company is the subsidiary of the Wilcox company which has its main offices in Chicago. The latter owns and operates its own hopper bottom railroad cars for bringing material from its Wisconsin plants to the Chicago market. As an advertising slogan the company has adopted the phrase, "Depend on Wilcox," which has been placed on all its trucks and railroad cars. The value of this slogan can readily be understood when one realizes how well known it actually is in the Chicago territory. It is short; it emphasizes one big selling point, dependability; and it fixes the company's name in the mind of the observer.

Shipping at this point is done over the Chicago, Milwaukee, St. Paul and Pacific Railroad, most of the material being sent directly to the Wilcox yards in Chicago. Harry J. Brown is superintendent at the Avalon plant.

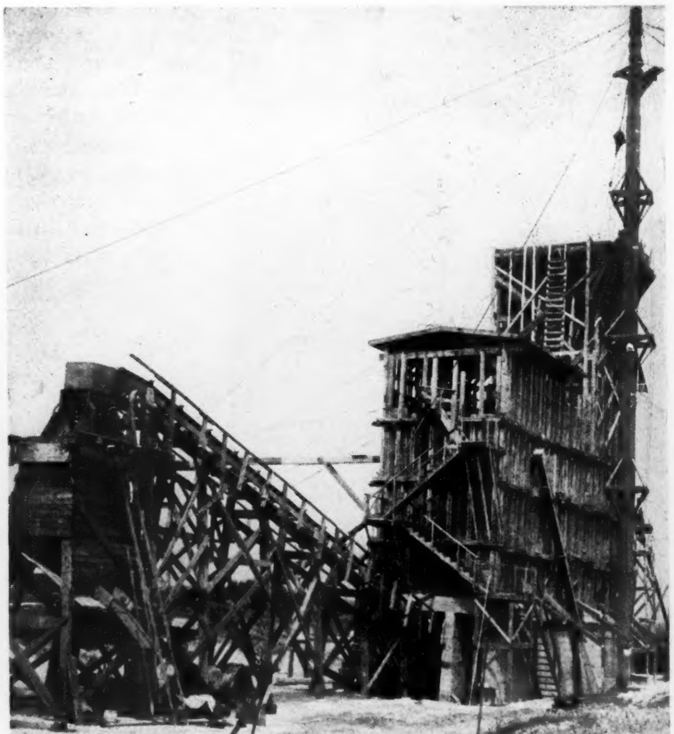
Consumers Co. Plant at South Beloit

The plant of the Consumers Co. at South Beloit, Ill., is one of the largest in the territory, turning out 100 cars daily, exclusive of cars loaded from storage piles, which at the height of the gravel season will vary from 10 to 35 additional cars daily. There is a big pit and at present the excavation is at some distance from the plant. The gravel is loaded to side-dump cars by a 70-ton Bucyrus steam shovel with a 3½-yd. bucket. The working face in the pit is 40 ft. high. The cars are brought to the plant three at a time by a steam dinkey, and then are dumped one at a time to the hopper above the belt conveyor to the crusher. This hopper is covered with a bar grizzly.

Stripping is taken care of by a Page dragline having a 100-ft. boom and a 3½-yd. bucket. The dirt is cast over the working face into the pit.

The belt conveyor to the crushing house is 24 in. wide and is fitted with steel cross strips 2½ in. wide, bent up at the sides of the conveyor to a height of 3 in. It operates up

The plant of the Consumers Co. at South Beloit, Ill., is one of the largest and steadiest producers in the whole Illinois-Wisconsin territory



The Byron Sand and Stone Co. plant at Byron, Ill., showing the new cableway mast at the right, and the automatic weigher at the left

to its capacity when the plant is running normally, as it carries material full to the top of the side pieces. This belt delivers the material to the scalping screen, which is fitted with woven wire screens made by the Manganese Steel Forge Co. That which passes through goes to the conveyor to the washing plant. The rejects from the screen go to two gyratory crushers below, one of which is an Austin No. 5 and the other a

Chutes for saving droppings from the main conveyor at the Consumers Co. plant. Note the side pieces showing on the returning belt

McCully No. 3. A 50-hp. General Electric motor drives the two crushers. The discharge of the two crushers drops to a small belt conveyor which returns it to the main conveyor from the track hopper.

The 24-in. conveyor from the crushing house delivers the material to three pairs of cone-shaped screens having punched plate holes. A General Electric motor at the top of the washing plant drives both the conveyor and the screens. A pair of sand-settling boxes follow the last pair of screens. The sizes produced at this plant are the Wisconsin gravel sizes Nos. 4, 8 and 9, and the sand sizes Nos. 1 and 2. The bins below the washing screens are so arranged that No. 8 and No. 9 can be mixed for concrete aggregate. A steam locomotive spots the cars for loading and delivers the loads to the railroad connections.

Water is supplied by a 4-in. Allis-Chalmers centrifugal pump and a 6-in. American Well Works pump, one of which is driven by a General Electric 40-hp. motor and the other by a 50-hp. Allis-Chalmers motor. A large pond furnishes the water supply.

The surplus material is stored in large piles near the plant, and reclaimed by a McMyler Interstate crane with a clamshell bucket when needed.

The company ships both by truck and by rail, using the C. and N. W. and the Milwaukee road for the latter. Much of the material goes directly to Chicago, where the company maintains large yards and where the main offices are. R. O. Webster is the superintendent at this plant.

Western Lime and Cement Co.

The plant at Afton, Wis., a few miles to the north of Beloit, Wis., was formerly owned and operated by the Howard Material Co. of Chicago, but has been recently taken over by the Western Lime and Cement Co. of Milwaukee, Wis. This plant is also larger than the average plant visited on this trip, as its daily output runs about 60 cars. It is thoroughly well equipped to handle this amount, and operations appear satisfactory in every way.

A 70C Bucyrus steam shovel and a Link-Belt crane with a clamshell bucket are used for loading in the pit to the hopper bottom cars. There is also a Lidgerwood dragline for stripping. A steam dinkey pulls the loaded cars to the plant from the far end of the pit, which is nearly half a mile away. As the dinkey is making the trip to the plant with one string of cars, the other string is being loaded in the pit. The pit is worked from one long, straight track along a straight face, the track being shifted as the bank is removed.

From the track hopper to which the cars dump, the material is carried to the scalping screen by belt conveyor. This conveyor, like practically all of the others at the Afton plant, was made by the Robins Conveying Belt Co. of New York. The material passing the scalping screen drops at once to the conveyor to the washing plant, while the rejects drop to two Allis-Chalmers gyratory crushers. The crusher discharge is returned to the belt above the scalping screen by a conveyor, completing the closed circuit, except that the fines are screened in the chute above the conveyor and passed at once to the belt transporting material to the washing plant. Each crusher is driven by a 60-hp. Howell electric motor.

The washing plant is on top of three steel bins. The belt conveyor from the scalping

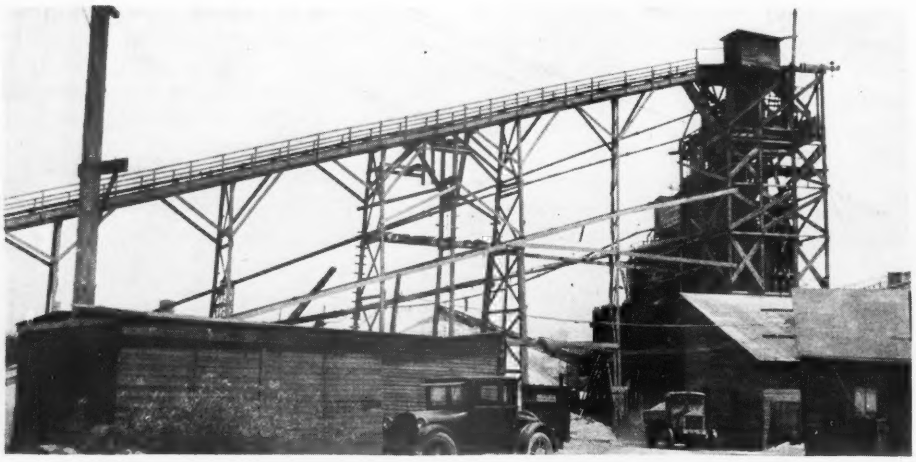
The three all-metal bins of the Western Lime and Cement Co. plant

screen delivers the gravel to a pair of 48-in. by 20-ft. sizing screens. Wisconsin sizes Nos. 4, 8 and 9 are produced here, and sand is recovered by two "Amsco" sand drags operated by a Howell motor. The material at this plant runs 70% to 75% gravel.

Water for the plant is furnished by an Allis-Chalmers centrifugal pump rated at 1200 g.p.m. and driven by a 100-hp. Allis-Chalmers motor.

Both truck shipping and rail shipping is done at this plant, the latter being over the C. & N. W. R. R. Spouts from one side of

The plant of the Western Lime and Cement Co. near Afton, Wis., showing the conveyor from the crushing house up to the washing plant at the left



The plant of the Northern Illinois Supply Co., which is located within the city limits of Rockford, Ill.

the plant are used to fill the cars, and the trucks are loaded at the other side. The plant is only a short distance from a main concrete highway, so trucking facilities are good. On each side of the plant there are four spouts, the center bin having two. Each outlet on the center bin meets the spout of the adjoining bin, so that there is a quick and convenient method of mixing different combinations of sizes as the trucks or cars are loaded.

Northern Illinois Supply Co.

One of the steadiest producing operations in the Illinois-Wisconsin district is the plant of the Northern Illinois Supply Co. at Rockford, Ill., where that company has been operating this gravel business since June 7, 1907. This plant is located within a community of close to 100,000 people and finds a market in Rockford and the surrounding territory, for 50% of its output, the balance going to the Chicago District. Unquestionably the steady output of this plant is founded on the regular and normal demands of its own community, and built up by the service which the company can render to its customers. The plant itself is of good size, having a capacity of 1800 yd. in a 10-hr. day, or something more than 45 cars every day.

The Northern Illinois plant has had a rather varied experience in its excavation methods. It was originally a dragline operation, but this means was abandoned some years ago to provide for a larger capacity than was possible with the first method. A dredging outfit was then installed and this was used until about two years ago. Mr. Leason, the superintendent, gave several reasons for the change to the present system of excavation with an electric shovel. The reasons included economy of operation, character of the deposit, and increase in efficiency. After the change to electric shovel was made, the saving in power alone for the year 1927 was $3500, according to Mr. Leason, and he estimated that another $2000 was saved by eliminating previous repair costs. A 460 Marion electric shovel for use in the pit was purchased in March, 1927. Mr. Leason also stated that the long belt from the crushers to the washing plant was formerly replaced annually, but now that it carries dry material it has lasted in good condition for two years and appears to be good for another season. The saving of two-thirds of the upkeep on any large belt is a considerable item, as any operating man knows.

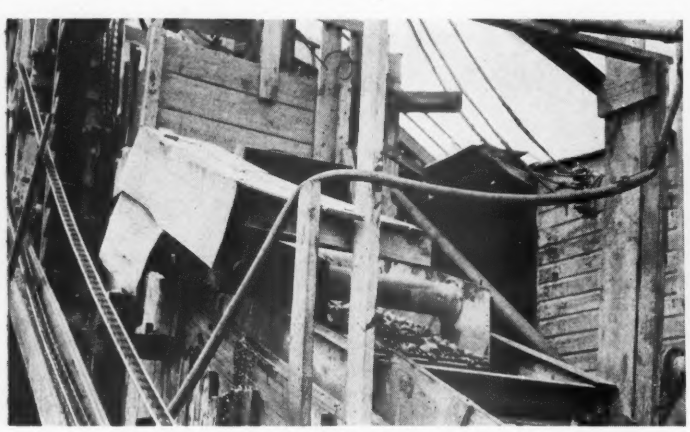
With the new system the output of the plant is no longer governed by the amount of material that can be taken from the bank, but instead by the amount that can be handled through the plant. Without any additional equipment the pit could furnish considerably more material to the plant, and by adding another dinkey the output could be doubled if the plant could care for it. As it is now, the shovel is idle about half the time, while the dinkey is pulling the car to the plant. However, with an electric shovel no power is used while the shovel is idle for these short periods, as would be the case with a steam shovel.

The pit is in one long cut with the track down one side for loading. This track is moved over as the shovel cuts farther into the bank. Nearer the plant is the old abandoned dredging pond which is now being used as a swimming pool to add a small increment to the plant earnings. A small Erie shovel is used for stripping. Mr. Leason estimated that there is enough good gravel on the property to last several years on the level they are now working, and it will be possible to take a lower level again at the end of that period with the same electric shovel by converting it into a clamshell or dragline.

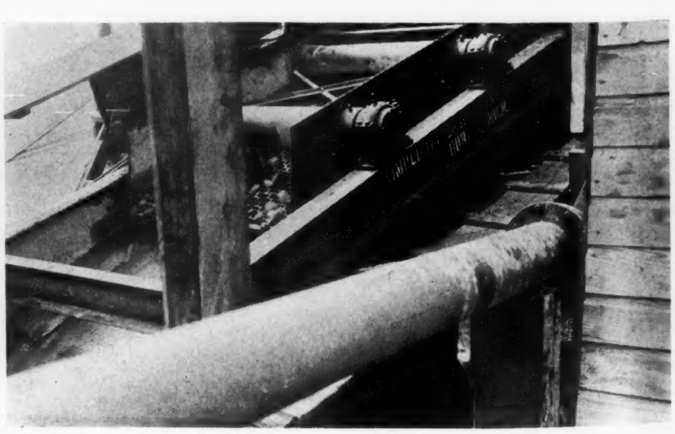
The Marion shovel loads to one of a pair of hopper bottom cars which are then drawn to the plant by a 12-ton Plymouth gas locomotive. At the plant the locomotive is uncoupled from the car and coupled to the other car (which has been unloading) and takes it back to the shovel. The shovel is on caterpillar treads and has 1½-yd. bucket.

An unusual feature of this plant is the use of vibrating screens throughout. The material from the track hoppers is taken by belt conveyors to a Universal vibrating screen. The throughs from this screen pass directly to the main belt conveyor to the washing plant, while the rejects fall to an Allis-Chalmers gyratory crusher. The crusher discharge is returned to the conveyor above the Universal screen, completing the closed circuit.

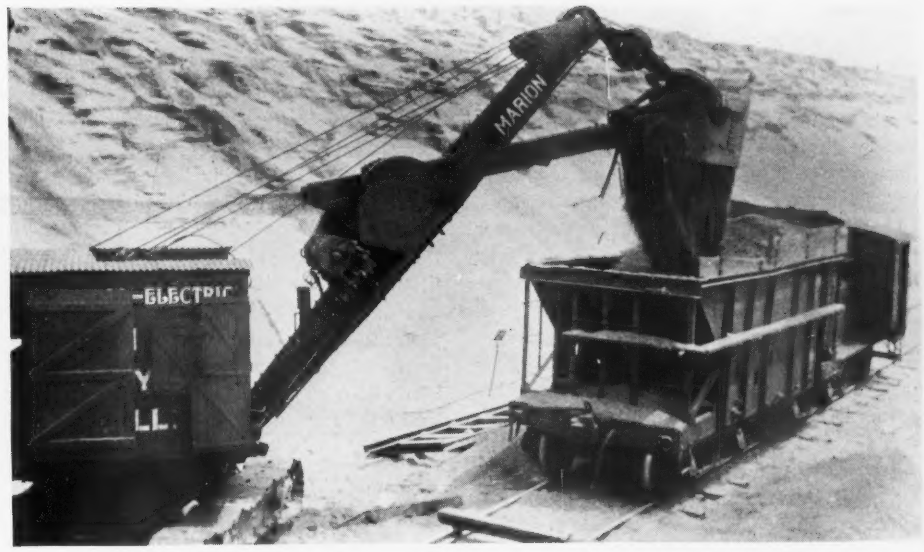
The belt conveyor to the washing plant is driven by an Allis-Chalmers 75-hp. motor. This conveyor delivers the material to a battery of three vibrating screens made by the Simplicity Engineering Co. of Durand, Mich., driven by a General Electric motor. In these screens the material is washed and separated to No. 7 and No. 9 gravel, pea or roofing gravel, and two sizes of sand, fine



Battery of vibrating screens in the washing plant of the Northern Illinois Supply Co.



Sizing screen at the Northern Illinois company plant. This plant uses vibrating screens throughout



Electric shovel loading to bottom-dump car in the pit of the Rockford plant

and torpedo. No. 8 gravel can also be made if desired. When a concrete aggregate is desired, No. 7 and No. 8 are mixed.

Water is furnished from the old dredging pond by a Worthington 6-in., high-duty, centrifugal pump, rated at 700 g.p.m.

The screen wire at this plant has always been an expensive item, according to Mr. Leason, until they recently started the use of manganese steel "Rolman" screens made by the Manganese Steel Forge Co. The old steel screens lasted about 15 days each before they had to be replaced, with the consequent delay and expense, while the new screens will last eight to ten times that long at least, he stated. This is another example of the care with which expense items are checked and remedies applied at this plant. This policy tends toward a solid foundation and an even, substantial output, as is shown by the steady operation of this plant.

The president of the Northern Illinois Supply Co. is B. B. Page, who also acts as general manager. Thomas Dunn, Jr., is secretary, and S. A. Gibson is treasurer and sales manager. Mr. Gibson has been in direct supervision of the sand and gravel division of the company since its inception 21 years ago. The company maintains its main office in Rockford.

Byron Sand and Stone Co.

The final plant visited on the editorial trip was not in operation at the time, as it was undergoing changes and improvements necessitating a short shutdown. This was the operation of the Byron Sand and Stone Co. at Byron, Ill., about 15 miles south of Rockford. While this operation is small compared to the others visited on the trip, it is of particular interest because of the variety of operations carried on by the company. At present the sand business is the biggest part of the company, but a small limestone quarry near the plant is also worked to produce agricultural limestone and road stone. Besides these two lines, the Byron company has a well-developed cement products plant adjacent to its sand plant. The latter, of course, uses the aggregates from the quarry and sand pit.

Up to the spring of this year the sand plant turned out only about 10 carloads per day with more or less makeshift equipment. Five wooden bins on concrete foundations had been built three years before but had never been placed in use, as no railroad connection had been made to the plant. The company operated its pits only sufficiently to get out the gravel required for its own products plant and for consumption in the town of Byron and the surrounding country. This material was trucked out, much of it going for road work. During that period the pit was worked by a ½-yd. drag scraper delivering the material directly to the screens in the pit. All the screening was done by gravity in the pit itself.

At the time this plant was visited a new Sauerman Bros. slack-line cableway excavator was being installed. This is equipped with a 1½-yd. bucket and will take the material directly from the pit to the top of the plant, where it will be deposited in a hopper above the screens. This will at least treble the company's gravel output, giving the plant a capacity of 30 or more cars a day. Since the railroad siding from the Chicago Great Western R. R. has been completed to the plant within the past year, the increased output can be shipped out. Material will also be shipped over the C., M., St. P. & P. R. R.

The hopper at the top of the plant delivers the material to a battery of three pairs of cone-shaped Link-Belt washing and sizing screens. These are followed by four Dull sand settling cones. The material drops directly to the bins beneath, three of which are for the three sizes of gravel and the other two containing two sand sizes. The deposit at this operation runs approximately 40% sand and 60% gravel. The oversize from the largest pair of screens drops to a crusher which was recently transferred from the company's quarry and has now been set up at the sand plant. The discharge is returned to the screens by an elevator. The operation of the plant and also of the pit is entirely by electricity brought in on a 2300-volt line.

An interesting arrangement at this plant is the use of a belt conveyor running in a passageway under all five of the bins and out at one end to a Markman automatic weigher raised about 26 ft. above the ground level. Gates in the bottoms of each bin permit loading directly to the conveyor. The automatic weigher is rated at 1 ton capacity, but will take 1½ tons of sand, according to W. H. Ashelford, superintendent at the plant. He stated that this was the first large weigher that the Markman company had installed. Chutes below the weigher load directly to trucks. This weigher is much used for road work, particularly on state work, where the aggregates must be accurately measured. The company thinks it is the best machine for this work, since any given per cent can be fed from any bin at the same time. The weigher conveyor under the bins can also be used for stock piling any desired size of material. Loading is also accomplished directly from the bins by means of chutes.

The quarry of the Byron company is a small operation in a brownish limestone about a quarter of a mile from the sand plant. State tests show the stone to be high in calcium carbonate content. At present there is no permanent crushing plant in-

The pit of the Northern Illinois company, showing the shovel at work at the far end. To the right is the swimming pond made from an old dredging pond

stalled here, the stone being broken by a movable crusher made by the Williams Patent Crusher and Pulverizer Co. of St. Louis, Mo. This quarry is operated more during the winter months, the company putting in most of its efforts on the sand plant during the summer. Considerable agstone is sold to the farmers of the surrounding territory, and also quite a bit of the stone is used for road work. At present work is under way to enlarge the quarry operation.

The products plant turns out a wide variety of cement products, including such specialties as colored roof tiles and similar products. Much of its output is applicable to rural conditions, such as stock watering troughs and other products for use on the farm. The output is not large, but it furnishes a ready outlet for some of the aggregates produced, and the products seem to be in good demand in the community. The products are trucked out except that block and drain tile are shipped in carload lots.

The company operates trucks for delivering its sand, stone and products. A garage is maintained on the property and there is also a well-stocked machine shop, in which the repair work for the plant and the trucks is done.

The owner of the Byron company is W. H. Ashelford, with his sons in partnership with him. The office of the company is at Byron. This company, like most of the others in the territory, is contemplating entering the Chicago market and already has large contracts signed to furnish paving material for 1929.

Notes on General Practice in the Territory

The plants visited on the trip may be considered fairly representative of the region passed through. It will be noted that few of the plants have particularly large outputs, except those at Beloit and Rockford. The territory around Beloit has a number of large plants for which the Consumers Co. plant may well serve as an example. Otherwise the plants are small, the operations described being very good examples of the general type of plant found along the Illinois-Wisconsin state line.

As a general thing there are not many large boulders in the deposits along the south edge of Wisconsin. Most of the plants do not consider the large stones sufficient in number to warrant the operation of a large crusher and the stones are taken out by grizzlies or by hand and thrown to one side. Occasionally some of the smaller stones cause considerable trouble in the small crushers, as they are liable to be of particular toughness.

The typical operation in the territory might be considered one in which the material is dug from the bank by steam or electric shovel and loaded to a dump car for transportation to the plant. However, long conveyor belts in the pits are not uncommon, and dragline scrapers are also used to some extent. The typical plant has its washing and screening equipment above three or four bins, usually consisting of a number of revolving sizing screens followed by one or two sand settling boxes. Water is to be found in abundance throughout the territory, and in practically every instance the plants make a good job of their washing. Very little clay was noted during the whole trip, indicating that the washing job is not as difficult as in some locations.

Although these plants are small, it is noted that they generally are efficiently designed and operated, producing material at a low figure per ton. However, as much of this sand and gravel goes to the Chicago market, where competition is keen, the result is that only a small profit can be made. Many of the plants of the territory are units of larger organizations whose home offices are in Chicago, Milwaukee, Kenosha or other cities along the Lake Michigan shore. The facilities of these large organizations permit the steady flow of material to the city yards, even though the demand has slumped, so the average plant of this territory is a steady and consistent producer.

New Bulletin on Simplified Practice Recommendations for Structural Slate

THE Bureau of Standards, U. S. Department of Commerce, has just issued a new bulletin, No. R13-28, containing simplified practice recommendations for structural slate for plumbing and sanitary purposes. The object of the Bureau in bringing out these recommendations is to eliminate waste and to make it possible for dealers to stock slate sizes in a few basic dimensions instead of carrying wide range of sizes or not carrying any stock at all. Slate, being a natural product, can be cut to any desired sizes to meet any unusual conditions without the employment of special dies, patterns or molds. But the recommended sizes are suggested for the purpose of encouraging a demand that will justify some production of units for stock. Such predetermined stocking will provide employment for quarry and mill workers during slack periods, it is claimed, and will expedite the shipments on standard sizes. The bulletin gives the committee's simplified practices recommendations and lists the slate producers and mills which have accepted the recommendations. It should be of vital interest to anyone in the slate business who is interested in the future of this branch of the rock products industry.

The bulletin may be obtained for 10 cents from the Government Printing Office, Washington, D. C.

Production of Crushed Stone Continues to Increase

THE production of crushed stone in this country in 1927, according to the United States Bureau of Mines, Department of Commerce, amounted to 94,948,770 short tons valued at $97,474,267, which was an increase of 15% in quantity as compared to the production for 1926. Crushed stone for concrete and road work (78,544,210 tons, valued at $84,177,237) increased 17% in quantity and crushed stone reported as used for railroad ballast (16,404,560 tons, valued at $13,297,030) increased 5%.

Table I shows the sales of crushed stone in 1927 by uses and the sales of 1926 for comparison. Table II shows the crushed stone (including concrete and road metal and railroad ballast, but not including fluxing stone or agricultural limestone) sold or used by producers in the United States in 1927, by states, giving both the number of short tons produced in each state and the value of the stone produced.

TABLE I.—CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, 1926 AND 1927, BY USES

	1926		1927	
Use	Quantity —short tons	Value	Quantity —short tons	Value
Crushed stone	82,515,560	$87,872,014	94,948,770	$97,474,267
Furnace flux	23,859,390	18,049,012	21,666,070	15,985,525
Agricultural limestone	1,850,620	3,064,235	2,206,470	3,360,704

TABLE II.—CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1927, BY STATES

State	Short tons	Value
Alabama	196,020	$ 113,304
Arizona	†	†
Arkansas	411,950*	439,228*
California	8,144,400*	6,649,277*
Colorado	187,880*	87,685*
Connecticut	2,168,070*	2,507,189*
Delaware	†	†
Florida	7,382,260	6,041,194
Georgia	485,850*	551,972*
Idaho	231,980	271,540
Illinois	7,643,700	6,006,004
Indiana	4,195,280	4,438,846
Iowa	971,730	932,236
Kansas	742,340	824,268
Kentucky	2,422,690	2,397,990
Louisiana	115,450	169,643
Maine	112,320	140,594
Maryland	985,790*	1,454,084*
Massachusetts	2,225,010*	3,177,016*
Michigan	1,832,700*	1,235,522*
Minnesota	552,790*	719,452*
Missouri	2,267,670*	2,860,335*
Montana	28,790*	27,933*
Nebraska	69,420*	70,824*
Nevada	355,600*	340,180*
New Hampshire	65,760*	81,739*
New Jersey	2,423,410*	3,695,462*
New Mexico	†	†
New York	8,945,410*	11,470,964*
North Carolina	2,079,850	2,902,998
Ohio	11,323,640	9,907,284
Oklahoma	1,668.120	1,326,585
Oregon	1,429,640*	1,488,273*
Pennsylvania	7,295,820	9,251,432
Rhode Island	126,190	259,022
South Carolina	1,164,830	1,632,225
South Dakota	221,880*	271,521*
Tennessee	1,751,890	1,809,358
Texas	2,896,430*	1,978,413*
Utah	113,500*	116,897*
Vermont	21,020*	31,625*
Virginia	2,335,290*	2,238,212*
Washington	586,350	404,508
West Virginia	740,120*	619,550*
Wisconsin	2,478,510*	2,469,652*
Wyoming	53,870	48,728
Undistributed	3,075,040	3,277,594
Hawaii	324,040	576,166
Porto Rico	98,470	159,743
Total	94,948,770	$97,474,267

†Included under "Undistributed."

*To avoid disclosing confidential information, certain states are slightly incomplete, the figures not included being combined under "Undistributed."

Lime Burning Based on European and American Observations

Part XII.—England and English Lime-Burning Practice

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

IT SELDOM PAYS to make up one's mind too quickly. After crossing the English channel from France on the way to London the train passed some lime kilns. They were extremely low and had all the earmarks of bygone ages. I practically assumed that lime burning generally in England must be very backward, if such ridiculously small "pots" were still being operated. But the kilns I saw, while being lime kilns, burned chalk, which as everyone knows is crumbly and high kilns would be impracticable. Later while in England I saw some kilns so perfect in detail of mechanical design and execution that to me, accustomed to seeing crudeness in lime plants, it not only was a surprise but a revelation. Although I learned much in Germany particularly about mixed-feed kilns capable of producing remarkably cheap lime, so far as gas kilns are concerned, not excepting the United States, I certainly would award the palm to England.

In London the writer first called on Dr. N. V. S. Knibbs, an outstanding student of lime properties and lime manufacture, author of a book, "Lime and Magnesia," which is popular with many lime manufacturers in the United States. Dr. Knibbs, who is introduced here in the accompanying portrait, has had some world-wide experience; he has visited various plants in the United States, has burned lime in Australia as well as in China. Dr. Knibbs also is consulting engineer for the Priest Furnaces, Ltd., of England, builders of the above mentioned gas kilns.

The call on Dr. Knibbs and exchange of information proved rather interesting to the writer. In one instance Dr. Knibbs, while in Australia, encountered an operation where the limestone is found mixed with peat; and to burn lime no other fuel is necessary; and since the peat is formed from a particular sea weed, in burning all the ash turns to lime and a clean product is so obtained. If this was the case with all limestones, we would not need to worry about kiln efficiency, and this series of articles hardly would be necessary.

Some Contrasts with American Practice and Conditions

It is most peculiar, the rather startling contrasts in conditions one may encounter in England and elsewhere—the chalk kilns and the gas kilns.

In spite of the fact that hydrated lime, so extensively used in the United States, is still almost entirely undeveloped in Europe, according to Dr. Knibbs, the Callow Rock Co., of England, sends hydrate of specially high quality to the United States to be used for varnish hardening. The Buxton Lime Co., of the Imperial Chemical Industries, ships lime clear around the world to Shanghai, China, for some special purpose.

Dr. N. V. S. Knibbs

In America there are hundreds of kilns with direct-fired grates; in England not a one. Practically all American kilns are "stuck" when drawing, and it is desired to do so; but this is an unknown practice in England.

In Germany the lime industry is thoroughly organized, in England hardly at all.

In the United States hydraulic lime is almost unknown, in Europe, particularly France, it is the main product. Almost all English, German, French and American lime producers know hardly anything about one another's operating methods; and that is the main reason for these contrasting conditions.

From London the writer proceeded to Sheffield with the main purpose in mind of calling on A. B. Searle. This gentleman was introduced to the reader at the beginning of this series (Fig. 5). The visit with Mr. Searle while short was very interesting. While Dr. Knibbs is the champion of the gas kiln, Mr. Searle leans towards the mixed-feed kiln. His statement as to their value was published in the third part of this series (March 17, 1928, issue).

British Arguments Against the Gas Kiln

There are a great many in England who do not consider the gas-fired kiln entirely practical; the mixed-feed kiln is preferred. Some of their opinions are valueless, lacking in the necessary sound foundation, others have some justification, if qualified by proper comparisons. Mr. Searle made the following statements:

1. There is no very energetic move for lime quality standardization in England; therefore, one will find quite a difference in quality.

2. While admittedly there is a certain amount of ash in lime from mixed-feed kilns, no better price is obtained for lime from gas kilns.

3. The best English, mixed-feed kiln, with anthracite coal of 14,000 B.t.u. per pound, uses 350 lb. of coal to 2240 lb. of lime. A ratio of 6.4 to 1, or 2190 B.t.u. per pound of lime—a kiln efficiency of 63%. He stated also that the best gas-fired kilns have a ratio of only 5 to 1, with the same quality coal.

The question is: Is not the ratio of 6.4 to 1 the very best the mixed-feed kiln can do; and are there not gas kilns that have a ratio of better than 5 to 1?

It must be remembered that the mixed-feed kiln is simple in its nature; the gas-kiln efficiency on the other hand is influenced by many items—kind of producer, amount of steam in the blast, suitability of coal for producer firing, insulation of gas lines, etc. While gas producers are nothing new, the application of gas producers to lime kilns is comparatively new. Some items exert an influence on efficiency that are still not fully understood, and if they are found out the gas kiln will be the gainer.

As a matter of fact a certain American gas kiln is getting a ratio of 5 to 1 with 12,000 B.t.u. coal, this being 2400 B.t.u. per pound of lime—an efficiency of 57½%, which is getting dangerously close to the above mentioned standard for the mixed-feed kiln. And further, that is not saying that this efficiency cannot be still further bettered, the

difference reduced still more, even though it is unlikely that the gas-fired kiln will ever thermally become equal to mixed-feed kiln.

The plant at Raisbey Hill, in Durham, England, to be later described, operates with 400 lb. of coal, per English ton of lime; this in terms customary in America is a ration of 5 to 1, or 2700 B.t.u. per pound of lime. The kiln efficiency is 51%.

British Now Working on Lime Standards

As stated before, Mr. Searle mentioned lack of applied lime quality standardization, but steps are being taken in that direction in England under governmental guidance. Classification will be into grades, of which grade A lime will be 95% calcium and magnesium carbonate. The builder, however, prefers a lime from stone of only 85% carbonate with 12% silica and some alumina—in other words an hydraulic lime. A high calcium lime mortar at first hardens mainly at the outer surface, an hydraulic lime mortar hardens where there is water. Often they soak brick in water to insure the presence of sufficient moisture in the middle of the joint.

As to English lime prices, Mr. Searle stated that lump lime sold at the works at between $5 and $7 per ton. Small-sized lime (of less than 2-in.) at between $1 and $3 a ton of 2240 lb. Hydrate sells for between $5 and $11, but there were only four out of the 500 plants that were making hydrate; and it is doubtful if any of these made hydrate to a great extent. The writer would not be surprised if many an American producer turns out as much hydrated lime annually as all the English plants put together.

London proper is surrounded with chalk-lime kilns, and these control the market price, which ranges between 50 to 58 shillings per ton retail, this being around $13.50. Some price even according to the American standards!

On leaving Sheffield the writer proceeded to Middlesbrough, where a call was paid at the office of the Priest Furnaces, Ltd., prominent builders of kilns and furnaces of various kinds. The call proved highly interesting and in the following few days several lime plants were visited located in that section of England.

(To be continued)

Sales of Barite and Barium Products, 1925 to 1927

SALES OF CRUDE BARITE in 1927, as reported to the United States Bureau of Mines, Department of Commerce, by domestic producers, amounted to 254,265 short tons valued at $1,670,878. These totals indicate an increase of 7% in quantity and a decrease of 6% in value of sales as compared with 1926. A study of the accompanying tables also shows that the increase in the industry has been steady since 1925. The totals of 1926, as shown, indicate that at that time there was an increase of 2% in both quantity and value of sales as compared with 1925.

Of the crude barite, in 1927, domestic and foreign, consumed in the manufacture of barium products, 65% was used in lithopone, 24% in ground barite and 11% in barium chemicals. Foreign crude barite imported for consumption in this country in 1927 amounted to 70,274 short tons, valued at $253,284.

Barium Products

Combined sales of the barium products—ground barite, lithopone and barium chemicals—by domestic producers amounted to 258,595 short tons, valued at $19,847,908, in 1927. As compared with 1926, sales of barium chemicals combined increased 9% in quantity and sales of lithopone increased 11%, and sales of ground barite decreased 0.27%.

The lithopone industry is now represented in Illinois and the middle Atlantic states and on the West Coast at Oakland, Calif. Missouri remains the center of the ground barite industry.

CRUDE BARITE SOLD BY PRODUCERS IN THE UNITED STATES, 1925-26

	1925			1926		
	Short	Value		Short	Value	
Product	tons	Total	Per ton	tons	Total	Per ton
Georgia	65,936	$ 475,618	$7.21	77,654	$ 532,706	$6.86
Missouri	101,056	794,927	7.87	118,919	946,595	7.96
Tennessee	47,012	345,038	7.34	20,910	155,780	7.45
Other states*	14,059	87,514	6.22	15,392	108,212	7.03
	228,063	$1,703,097	$7.47	232,875	$1,743,293	$7.49

*1925: Arizona, Nevada, North Carolina, South Carolina, Virginia and Wisconsin; 1926: Arizona, California, Illinois, Kentucky, Nevada, Virginia and Wisconsin.

CRUDE BARITE SOLD BY PRODUCERS IN THE UNITED STATES, 1926-27

	1926			1927		
		Value			Value	
State	Short tons	Total	Per ton	Short tons	Total	Per ton
Georgia	77,654	$ 532,706	$6.86	94,039	$ 580,300	$6.17
Missouri	118,919	946,595	7.96	111,456	797,465	7.15
Tennessee	20,910	155,780	7.45	20,537	129,999	6.33
Other states†	20,392*	138,212*	6.78	28,233	163,114	5.78
	237,875	$1,773,293	$7.45	254,265	$1,670,878	$6.57

*Revised figures.

†1926: Arizona, California, Illinois, Kentucky, Nevada, South Carolina, and Wisconsin; 1927: California, Nevada, South Carolina, Virginia, and Wisconsin.

BARIUM PRODUCTS SOLD BY PRODUCERS IN THE UNITED STATES, 1925-26

	1925			1926		
	Short	Value		Short	Value	
Product	tons	Total	Per ton	tons	Total	Per ton
Ground barite	49,674	$ 1,040,461	$ 20.95	52,964	$ 1,121,631	$ 21.18
Lithopone	145,019	15,186,147	104.72	159,931	16,062,197	100.43
Barium chemicals:						
Carbonate	4,962	279,346	56.30	5,394	298,121	55.27
Chloride	*	*	*	4,592	279,510	60.87
Sulphate (blanc fixe)	11,748	792,036	67.42	*	*	*
Other†	1,944	136,388	70.16	11,925	747,631	62.69
	213,347	$17,434,378		234,806	$18,509,090	

*Included under "Other."

†1925: Chloride, hydroxide and sulphide; 1926: Hydroxide, sulphate and sulphide.

BARIUM PRODUCTS SOLD BY PRODUCERS IN THE UNITED STATES, 1926-27

	1926			1927		
		Value			Value	
Product	Short tons	Total	Per ton	Short tons	Total	Per ton
Ground barite	57,812†	$ 1,186,563†	$20.52†	57,658	$ 1,166,294	$20.23
Lithopone	159,931	16,062,197	100.43	176,994	17,163,620	96.43
Barium chemicals:						
Carbonate	5,394	298,121	55.27	5,969	313,613	52.54
Chloride	4,592	279,510	60.87	3,708	213,446	57.56
Other*	11,925	747,631	62.69	14,266	990,935	69.46
	239,654	$18,574,022	....	258,595	$19,847,908	....

*1926: Hydroxide, sulphate, and sulphide; 1927: binoxide, hydroxide, sulphate, and sulphide. †Revised.

Highway Engineering Conference Proceedings

THE Proceedings of the Fourteenth Annual Conference on Highway Engineering, which have recently been published, contain much of interest to highway engineers and road commissioners. The conference was held at the University of Michigan, Ann Arbor, on February 14-17, 1928.

The purpose of the conference was to aid in supplying information relating to the administration and organization of highway departments, regulation of highway traffic, designing and financing highway improvements, drainage systems and foundations, tests and specification of highway materials, maintenance of roadways and bridges with special reference to conditions in Michigan.

The publication contains 19 separate articles relative to the above subjects with discussion following each chapter. Two of these articles will be abstracted for publication in ROCK PRODUCTS, namely, "The Mineral Fillers in Sheet Asphalt Paving Measures," by Yasuhei Emori, and "The Study of Concrete Pavement from Core Drill Records," by C. E. Foster. They both contain interesting data for aggregate producers.

Gypsum and Anhydrite in the Manufacture of Portland Cement

Part I—The Effect of Various Forms of Calcium Sulphate as Retarders, and Also the Relative Importance of Anhydrite and Gypsum as Retarders

By Richard K. Meade
Consulting Chemical and Industrial Engineer, Baltimore, Md.

IN A PREVIOUS ARTICLE in ROCK PRODUCTS (March 31, 1928), the writer discussed the various manufacturing conditions influencing the setting time of portland cement, and called attention to the retarders which were used. In the article referred to, the statement was made that the writer was investigating the effect of the several forms of calcium sulphate as retarders. The present paper is written with the idea of presenting the results of these experiments and also giving in a general way the writer's impressions on the subject of the relative importance of anhydrite and gypsum as retarders for the setting time of portland cement.

Forms of Calcium Sulphate

Calcium sulphate occurs in nature in two common forms—*gypsum* and *anhydrite*. There are several less common compounds of calcium sulphate with sulphates of potash and magnesia, such, for example, as *syngenite*, which is a double sulphate of lime and potash with the formula $CaSO_4 \cdot K_2SO_4 \cdot H_2O$, and *polyhalite*, which is a triple sulphate of lime, magnesia and potash, $2CaSO_4 \cdot MgSO_4 \cdot K_2SO_4 \cdot 2H_2O$. These last two minerals, however, are rare. Hence they have little or no practical bearing on the present subject, as they are not ordinarily found in any appreciable quantity in workable beds of gypsum.

In the former paper, the relative combinations of gypsum and anhydrite were shown. It may be worth while, however, to repeat the information. Gypsum consists of calcium sulphate and water. When pure it contains 79.1% calcium sulphate and 20.9% water; or, stated another way, sulphur trioxide 46.5%, calcium oxide 32.6% and water 20.9%.

Anhydrite contains *no* water of crystallization and consequently when pure is calcium sulphate 100%, or sulphur trioxide 58.8%, calcium oxide 41.2%.

In addition to the minerals mentioned above there are quite a number of artificial forms of calcium sulphate which are produced when gypsum is heated. These are the hemihydrate, $CaSO_4 \cdot \frac{1}{2}H_2O$, commonly called plaster of paris, or "first settle stucco," and "soluble anhydrite," $CaSO_4$, which is the chief constituent of "second settle stucco." Besides these, there is a "dead burned gypsum," which combined with certain accelerators is known as "Keene's cement." The hemihydrate is made by partially dehydrating gypsum at a temperature of about 116 deg. C. and discontinuing the heat treatment at about 160 deg. C. In second settle stucco, the heating is discontinued at about 200 deg. C. Keene's cement is burned at a red heat at a temperature of 650 deg. C. to 800 deg. C., in a somewhat similar manner to lime.

All anhydrite, as well as gypsum is soluble. Indeed, anhydrite is more soluble than gypsum. Soluble anhydrite, therefore, is a misnomer in that it suggests that the native anhydrite is insoluble, which is not so.

Setting and Hardening of Gypsum Products

The dehydration of gypsum has been quite fully discussed in a previous article. This discussion need hardly be repeated at this time, except to say that it is quite certain that in cement manufacture a large part of the gypsum is converted to anhydrous calcium sulphate during grinding, due to the heat of the clinker and of the grinding mill.

When it is recalled that by grinding in a hand mortar in the laboratory, a large percentage of the water of crystallization of gypsum may be driven off; that a sulphuric acid desiccator will remove water of crystallization from cold ground gypsum; and that the effect of the sun's heat is sufficient to partly dehydrate the surface of gypsum deposits in arid climates; it is easy to understand how anhydrous calcium sulphate can be made from gypsum in a cement tube mill. The heat of grinding and of the clinker, the tremendous pressure due to the weight of the ball and clinker charge, the impact of the balls, and the intense abrasive action of the hard rough clinker, all combine to drive out the loosely held water of crystallization.

The chemistry of gypsum is by no means as well understood as it might be. Considerable investigation of the problem has taken place in the last ten years. It is generally stated as a fact that the hydration of gypsum is not progressive—that is to say, that when gypsum looses its water, the hemihydrate is first formed and that there are no intermediate products. What appears to be partial dehydration is merely a mixture of gypsum and hemihydrate.

In comparing the natural anhydrite with soluble anhydrite one very important difference presents itself at once. The two compounds both show on analysis no water of crystallization. The soluble anhydrite, however, will take up water and set similarly to plaster of paris. The natural anhydrite will not, unless *very* finely ground, as noted further on in this paper, set on mixing with water. Keene's cement is completely dehydrated, yet when mixed with water it takes up water of crystallization and sets.

As previously stated, anhydrite when ground to the fineness of ordinary gypsum plaster shows no setting properties. If, however, it is very finely ground it does set to some extent. In connection with the experiments described further on in this paper, the attempt was made to prepare very finely ground anhydrite by grinding this wet and separating the very finest material from the coarser material by suspension in water. It was found, however, that when the fine materials were allowed to settle, a fairly solid mass was formed, and when this was dried and analyzed it was found to have hydrated to a slight extent, proving that, if finely ground, anhydrite itself will take up some water of crystallization.

Association of Anhydrite and Gypsum in Nature

Anhydrite has never been used alone in the manufacture of wall plaster, but a mixture of anhydrite and gypsum is used. Ordinary wall plaster is not so finely ground as cement and hence the anhydrite in such a mixture may not be ground fine enough to be of great value. It is not entirely certain that anhydrite in plaster making is always entirely inert. In some cases, for example, in making stucco from Nova Scotia rock in the rotary calciner, where heat is much higher than in the kettle, some practical plaster men believe that part of the anhydrite reabsorbs water and becomes active. The reason for this belief is that the plaster has more strength than it would if all of the anhydrite were inert.

Anhydrite is usually found associated with gypsum. Not all gypsum deposits contain anhydrite, however. It is quite possible, nevertheless, that many mines which at the present time produce gypsum free from an-

hydrite will on further exploitation give increasing percentages of anhydrite in the product of the mine. This is due to the fact that experience has shown that as the mining operations go deeper and get further away from the surface, the gypsum beds often alter to anhydrite. Dr. D. H. Newland advances the theory that gypsum is the result of the hydration of anhydrite. In other words, that the mineral originally occurred as anhydrite, but has been hydrated by exposure to water at and near the surface, forming gypsum. At the present time, a great deal of gypsum is available which is free from anhydrite, but if this theory is true, gypsum mines would seem to face a time when material free from anhydrite will not be obtained.

Some of the largest and finest deposits of gypsum occur in Nova Scotia. These deposits are accessible by water to the Atlantic seaboard and consequently to the cement mills of the Hudson River and Lehigh districts, Norfolk, Va., Tampa, Fla., etc. These gypsum fields, therefore, offer the cheapest and best source of supply for this section. Nova Scotia gypsum contains some anhydrite, and, while this gypsum has been used in the cement industry almost since the inception of the rotary kiln, there has recently developed some prejudice against it on this ground.

Objection to Anhydrite Not Well Founded

It is difficult to trace the origin of the objection to anhydrite, although unquestionably a paper* published by Ernest E. Berger, of the U. S. Bureau of Mines, may have done something to strengthen this belief, and no doubt his views have been widely circulated by those producers of gypsum who could offer a product in which there was but little anhydrite. Mr. Berger's paper is interesting as calling attention to some variation in the activity of anhydrite and gypsum as a retarder of the setting time of cement, but his investigations were not sufficiently close to actual practice to indicate with any degree of assurance that anhydrite is not effective as a retarder.

Most objections are founded either on theoretical considerations or practical observance. Let us consider the prejudice against anhydrite from both sides—first from the practical side, the results obtained in the mill with gypsum containing a considerable percentage of anhydrite.

Nova Scotia gypsum containing anhydrite was used almost exclusively in the Lehigh district and elsewhere prior to about 1904 or 1905, when the gypsums from western New York came into this field. These gypsums were not so high in sulphur trioxide as the Nova Scotia gypsum and contained considerable clay matter and calcium carbonate. On the other hand, they were somewhat cheaper, due to, at that time, a more favorable rail rate from Oakfield than water rate from Nova Scotia. The change was purely a matter of economy, and not due to any fault found with the Nova Scotia product as a retarder. For purely economic reasons the low-grade gypsums gradually replaced the Nova Scotia rock, the war and consequent scarcity of shipping completing the transformation.

*Serial No. 2705.

The Nova Scotia gypsums are very pure. They ordinarily contain 98% to 99% of the hydrous or anhydrous forms of calcium sulphate. The total impurities are practically always less than 2% and often as low as 0.5%. Their analysis varies between 45½% and 51% sulphur trioxide, depending largely on the amount of anhydrite present.

Gypsum containing anhydrite has been used for retarding the set of cement at many mills. In some instances this use has extended over many years.

As stated, Nova Scotia gypsum, which nearly all contains anhydrite, was extensively used in this country prior to 1905. In this connection, the reader should also remember that the conditions of cement manufacture at that time were nowhere near as good as they are today. Much of this Nova Scotia rock was used in the Lehigh district and at that time a fineness of 92% passing the No. 100 sieve was considered fine grinding of the raw material, and at many mills the fineness did not exceed 88% passing this sieve. It is quite frequent now to see a fineness of 88% to 92% passing the No. 200 sieve at plants where the raw materials were formerly ground to this same fineness through the No. 100 sieve. This coarse raw material made it necessary to carry the lime in the cement considerably lower than is the usual practice at the present time, and the tendency of the low lime cement to set quickly has been amply demonstrated. It would seem, therefore, that if trouble with the setting time was to occur from the use of anhydrite it would have been much more likely to occur in the past that at the present time.

Recent mill experience with anhydrite-gypsum mixtures in cement mills on a large scale gives ample proof of the practical value of such mixtures. Over 15 mills in New York, New Jersey, Pennsylvania, Maryland, West Virginia and Florida have been using Nova Scotia gypsum containing 15% to 35% anhydrite, for from six months to two and a half years. Occasionally on test runs, etc., gypsum with 50% or more anhydrite has also been used. Over 30,000,000 bbl. of cement have been made under all conditions of weather, temperature, storage, etc., by the dry process and the wet process; with high alumina and low alumina, high silica and low silica, and coarse ground and fine ground, without any trouble due to the anhydrite. The continued and increasing use of this rock is proof that it has the proper qualities as a retarder, and that there is economy in its use. Regardless of all laboratory tests, the impressive record of actual use of gypsum-anhydrite mixtures is the best possible evidence of their value.

The writer has been using, for the past year, gypsum containing anhydrite in one plant of which he is consulting chemist. This plant has been making high-early-strength cement, and the product is ground to a fineness of 92% passing the No. 200 sieve. The silica-alumina ratio is from 2.9 to 3.1. At no time has any trouble been experienced with the setting time of the cement. The extreme fineness of the above cement would indicate that this was a fairly severe test. No abnormal proportion of gypsum is used at this plant, the effort being to have the SO_3 about 1.75%.

This is only one instance, and the instances might be multiplied. It would seem, however, to present a fairly severe test.

Two or three plants in Canada have used gypsum high in anhydrite for many years. These plants do not grind so fine as the one mentioned, but their silica-alumina ratio is much higher. These plants have never experienced any unusual trouble with quick-setting cement and what trouble they have had has been easily attributed to other causes.

A committee of the American Society for Testing Materials (Committee C-11, Subcommittee I) is now investigating the use of mixtures of anhydrite and gypsum as cement retarders. This committee made a preliminary report March 22 in which the details of an experiment with a mixture of 60% gypsum and 40% anhydrite as a retarder at one of the mills of the Lehigh Valley was described. The result of this experiment was such that the committee concluded that at this mill such a mixture *was as effective* as gypsum, and that the quick-setting difficulty previously reported with cement from this mill was due to low SO_3 content rather than to the presence of anhydrite.

Nova Scotia gypsum brought into this country at the present time contains usually about 20% to 25% anhydrite and rarely more than 35%.

Difficulty of Determining Anhydrite Accurately

Prior to a few years ago, I believe, very little attention was paid to anhydrite by the cement chemist, and no very good methods for determining this material have even yet been devised. The method suggested by the American Society for Testing Materials consists substantially in heating a thin layer of not less than 450 grams of the sample for two hours at a temperature of 45 deg. C. in order to drive off any hygroscopic moisture present. Formerly a temperature of 60 deg. C. was employed, but in 1921 the specifications were revised to direct the carrying out of the drying at the lower temperature. One gram of the dried sample is next ground to pass a No. 100 sieve and heated in a covered crucible at from 215 deg. to 230 deg. C. to a constant weight. This loss in weight is considered as combined water. The sample is also analyzed for the percentages of lime and sulphur trioxide and, from the result of these three determinations, the percentages of gypsum and anhydrite are calculated.

To determine gypsum multiply the combined water by 4.778. To determine anhydrite calculate all the sulphur trioxide to anhydrite by multiplying the percentage of the former by 1.7. Call this result *A*. Next calculate the gypsum to anhydrite by multiplying the percentage of the former by 0.7907 and call this result *B*. The percentage of anhydrite is the difference between two results, or $A - B$.

The objections to this method are several. Among them may be noted: First, that the fine grinding of gypsum is liable to drive off some water of combination due to friction; second, some of the combined water of gypsum is driven off at temperatures as low as even 45 deg. C.

Welch† gives some interesting results illustrating the difficulty in obtaining accurate determinations of the percentage of anhydrite in gypsum rock. He shows that different chemists, or even the same chemists using different methods, report widely varying percentages of anhydrite in the same sample. For example:—On a certain sample of gypsum Chemist 1 reported gypsum 54%, anhydrite 8%; Chemist 2, gypsum 68.5%, anhydrite 0.7%; Chemist 3, gypsum 64.2%, anhydrite 4%; while the microscopist, a trained petrographer, reported *no* anhydrite present.

More Accurate Method

Welch suggested for the analysis of raw gypsum that the sample be ground to pass a No. 48 sieve and the hygroscopic moisture be determined by drying to a constant weight in a current of air having a vapor pressure slightly greater than the dissociation pressure of gypsum at the temperature of the experiment. He gives a curve showing the strength of sulphuric acid necessary to give air of the desired humidity. At 60 deg. temperature the specific gravity of the acid should be 1.51 and at 86 deg. it should be 1.31. Intermediate temperatures may be found by interpolation. The loss of water is reported as "free water" or "moisture." The sample is then completely dried in a U-tube heated over a sand bath at 200 deg. C. During the drying, a current of air dried over concentrated sulphuric acid is passed over the sample and the water given off is absorbed in concentrated sulphuric acid. The water is determined both by weighing the absorbed water and the loss in weight of the sample. Welch claims that this method gives much more accurate results than the A. S. T. M. method.

It is difficult to check Welch's method, and while it may give accurate results under expert manipulation, it is hardly suitable as a routine laboratory method. Probably, the only really accurate method is the quantitative microscopic method described by Larsen.‡

It will be seen from the above that under the ordinary conditions of plant analysis it is doubtful if the average chemist has known at any time how much anhydrite the gypsum which he was using contained.

†*Industrial and Engineering Chemistry*, Vol. XVI (1924), page 238.
‡Larsen, E. S., Iowa Geological Survey, Vol. XXVIII, pages 392-399.

Very little appears to be available in the literature of cement on the use of anhydrite and gypsum as retarders. The standard French, English and German works, which I have consulted, do not mention anhydrite in this connection. It is known, however, to be present in some foreign gypsums, and consequently abroad chemists probably consider anhydrite as equivalent to gypsum as a retarder in cement manufacture.

Laboratory Tests Hard to Make

Laboratory experiments have been conducted at numerous plants in this country and, as noted, by Mr. Berger of the Bureau of Mines. A subcommittee (I) of Committee C-11 on gypsum products of the A. S. T. M. has also done some work and has made some informal preliminary progress reports.

The difficulty of forming conclusions from all such laboratory tests of cement is that the properties of the cement depend so largely on the fineness to which it is ground, and fineness is very hard to control. It is not so much the grinding to a definite standard such as can be determined by the ordinary sieves, as it is to control the degree of fineness which goes beyond the measurements of sieves. In other words, to regulate the "impalpable powder" or "flour." Practically all cement chemists are familiar with the fact that samples of cement ground in the laboratory, in a small jar-mill, for instance, vary greatly in properties from those ground in the large mills employed in the plant, even though the tested fineness in each case may be the same. This is unquestionably due to the amount of flour in the cement.

There are probably few cement chemists who are not thoroughly familiar with the limitations of the sieve tests, but probably few of them realize that cement may be made to all pass the No. 200 sieve and yet have practically no setting properties or strength. This can be accomplished by grinding cement in a mortar or by a set of rolls and separating the ground and unground materials at very frequent intervals by means of a No. 200 sieve. By this means a cement can be obtained fine enough to pass this sieve and which yet will have practically no strength when tested with sand, showing that cement owes its strength to the "impalpable powder" or "flour" which it contains.

In comparing laboratory tests with mill tests, the observer at once notes two points. One of these is the fact that the cement ground in the laboratory very seldom shows anything like the strength that is obtained by the same clinker ground to the same degree of tested fineness in the cement plant. Another is that the setting times do not agree and that the cement ground in the laboratory seldom shows the same setting time as that ground in the mill and is usually the quicker setting of the two.

Most of the laboratory mills of the jar type are enclosed mills in which any steam which may be developed from the clinker is confined in the mill and probably is reabsorbed by the clinker. Whether this steam has any effect on the cement or not is hard to say. We do know, however, that cement is very susceptible to hydration and the degree of hydration very materially influences the properties of the cement. The grinding done in the jar-mill is also done under much lower temperature conditions.

It is, however, more probable that the difference in properties of cement ground in the laboratory, as compared with that ground in the plant, is due to the fact that the large mills in the plant give more flour than do the small laboratory mills. It is difficult to see why the cement ground in the laboratory should set more quickly than that ground in the plant. One would expect the opposite, and that the cement with the largest amount of flour would set the more quickly of the two. Possibly the hydration or heat previously referred to may be responsible for this. Possibly the softer and less well burned clinker may grind the more quickly in the small mill giving a greater preponderance of the lighter burned material in the most active portion of the cement. Or even more likely, the retarder may not be ground fine enough in these small mills, to become active, etc. Other possible theoretical differences will occur to the reader.

In most published tests, the retarder and clinker have been ground separately and then mixed. Results obtained under these conditions would naturally be quite different from what would be obtained when the two are ground together. It is possible that the mixing of the retarder and the cement can be sufficiently done after the two are fully ground. It must be admitted, however, that a much more intimate and thorough mixing would be likely to occur if the two were ground together. More important still, however, is the fact that both gypsum and anhydrite are considerably softer than cement clinker and when the two are ground together the gypsum or anhydrite, as the case may be, is reduced to a much finer powder than the average of the cement. This is shown by the fact that the retarder is always found in the finest portion when the cement is subjected to an air analysis.

Anhydrite is somewhat harder than gypsum and consequently if ground alone it would not be reduced to the same degree of fineness as would be the case when gypsum is ground alone. It is quite probable, therefore, that where gypsum and anhydrite have been added to fully ground clinker, that the gypsum may have been the more active of the two simply because the more finely ground.

Reasoning from Plant Results Often Faulty

Many plant chemists have formed their conclusions as to the use of anhydrite and

gypsum from observation of conditions at the plant. It is seldom, however, that a chemist has a sufficiently accurate picture of the question to form definite conclusions. The situation is often this: Trouble develops with the setting time of the cement. The gypsum formerly used is discontinued and gypsum purchased from another locality. Coincident with this, the trouble with the setting time ceases. The chemist, therefore, concludes that the first gypsum was probably responsible for the quick-setting of his product. Such reasoning is, of course, fallacious for other conditions changed at the time the gypsum was changed. Where trouble of this sort develops it is quite natural for the chemist and the plant operatives generally to be on the lookout for all conditions which might influence the setting time of cement, and they are consequently striving to eliminate all adverse conditions. It is most probable that at the same time the gypsum was changed some other condition which was the real cause of the quick-setting was unconsciously eliminated, with the consequent ending of the setting-time trouble.

I have several instances in mind where such reasoning was proved at a later date to be a fallacy by the fact that the mill returned to the use of the first gypsum without having any further trouble with the setting time. Reasoning of this sort is not confined to gypsum only. On one occasion, the writer was called into a plant in the Lehigh district where they were discarding the clay (stripping) found on top of the limestone and bringing in slate from some distance to mix in which the cement rock, which was high in lime. The writer was told that this clay could not be used as it always caused quick-setting and unsoundness due to high alkali. After a thorough investigation (which, incidentally, disclosed that the slate contained as much alkali as the clay) the use of the slate was discontinued and instead the clay on top of the rock was used. No difficulty was encountered in connection with its use and it has been used at that mill ever since.

Many a Mill's Peculiarities Should Never Exist

We often hear the statement made that at one mill certain things can be done and at another they cannot be done. Chemist *A* will state positively that he cannot use gypsum as does Chemist *B*, but must use plaster of paris, instead, because his clinker is quite different from that of Chemist *B*. His clinker probably does differ from that of Chemist *B*, but it is quite possible that his clinker would be considerably better if it were similar to that of Chemist *B*, and it is often possible to make it so. The writer feels, therefore, that where the statement is made that the clinker is abnormal, that the first concern of the chemist should be to produce a normal product, rather than to make an abnormal one and adapt other mill conditions to this.

The writer, of course, realizes that raw materials for cement manufacture are not the same everywhere and that these will vary quite largely among themselves in the relative proportions of their various constituents. At the same time, quality is unquestionably less effected by moderate variations in the percentage of alumina, silica and iron oxide in the raw materials than it is by the ordinary operations by which these raw materials are converted into cement—that is to say, the proportioning of the raw materials (the lime ratio), the grinding of the raw material, the burning of this and the grinding of the clinker.

The writer has called attention in a former paper to the various manufacturing conditions which might influence the setting time of cement and, as stated in that paper, considerably better results will be obtained by giving thought to the quality of the clinker rather than spending too much time on the selection of a retarder.

Manufacturing Conditions Affecting Setting Time

For the benefit of those who do not have the former paper, the writer might sum up some of the conditions which, in his estimation, are likely to produce trouble with the setting time of cement.

1. Lack of proper balancing between the lime on the one hand and the silica, iron oxide and alumina on the other.
2. Lack of uniformity in burning the clinker.
3. Grinding hot clinker.
4. High alumina.
5. Retarder not properly mixed with the clinker.

Contrary to the general opinion, I would rank a high percentage of alumina as one of the easiest of these difficulties to overcome, as it has been my experience that provided the alumina-silica ratio is not way beyond the range of ordinary practice, high alumina cements can be made slow setting provided they have enough lime.

Theoretical Conditions

Referring to the theoretical side of the question of the value of anhydrite and gypsum as retarders, it is difficult to see why one form of calcium sulphate should not be fully as effective as another except as influenced by the solubility of the compound and its fineness. It is, of course, understood that the finer a compound, the more surface is exposed to the solvent and consequently the more rapidly it will go into solution. Of two retarders, therefore, it is quite probable that the one more finely ground would act more rapidly. The fineness would also influence to some extent the distribution of the retarder through the cement. Manifestly, the finer the particles are ground the more uniformly they would be distributed through the mass.

It is quite evident from the nature of things that the reaction that occurs between the clinker and the gypsum, which causes the latter to slow the set of the former, is a wet reaction; or in other words, occurs after the gypsum is in solution. It seems most probable that the gypsum either is first dissolved and that this very dilute solution of calcium sulphate reacts less quickly with the clinker than purer water, and hence delays the set of the cement. Or else, that the gypsum goes into solution simultaneously with the hydrolysis of the clinker and delays the formation of the colloidal silica, etc., achieving the same end. It is quite evident, that if a solution of calcium sulphate must be formed before the retarder acts, all forms of calcium sulphate must have the same reaction, since when dissolved they would all produce the same compounds in the solution. The strength, or rather the rapidity of solution formed, as stated, would depend on the amount of calcium sulphate present, the solubility of the different forms of calcium sulphate, the fineness to which this reagent is ground and the rate of solubility of each form.

The water of crystallization manifestly can have no effect on the solution except to increase the dilution of the latter by a very minute amount. The reader must remember in this consideration, however, that the solubility of gypsum is very low, and that it is probable that the gypsum goes into solution and then out of solution by combining with the clinker in some manner which we do not understand, at a progressive rate, leaving the water free to dissolve more gypsum, etc.

Experiments have shown that anhydrite really must be more soluble than gypsum, for when anhydrite is placed in water for a long period, it slowly goes into solution and recrystallizes out on the side of the vessel in the form of *gypsum*. If gypsum were more soluble than anhydrite, this could not happen. The *rates* of solubility of gypsum and anhydrite, however, are probably not proportional to their true solubilities.

Outline of Present Experiments

The writer undertook a series of laboratory experiments to determine the efficiency of anhydrite and gypsum as retarders in cement manufacture. This was done with a good deal of misgiving for the reasons set forth previously in this article and it is realized that the writer's experiments are open to many of the objections to laboratory tests in general, which he has stated. He believes, however, that they are conclusive enough to show that anhydrite and gypsum have quite similar properties as retarders for cement. They indicate that the gypsum may be slightly the more efficient of the two, owing to the fact that it is easier ground, or the more quickly soluble. There is certainly no evidence to show that the anhydrite is not effective or that it confers any unwanted properties on cement.

(The concluding portion of this discussion, describing the experiments referred to will appear in an early issue of ROCK PRODUCTS.)

The Batesville White Lime Company Operations

A Modern Lime Plant in the Southern Ozarks of Arkansas

The new plant of the Batesville White Lime Co. at Batesville, Ark.

THE TOWN OF BATESVILLE, ARK., from which the Batesville White Lime Co. derives its name, is the county seat of Independence county and has a population of 7500 people. The Missouri Pacific railroad connecting Kansas City, Mo., and Little Rock, Ark., and other southeastern points is the only railroad serving this portion of the county.

The community derives its chief support and income from the farming industry, corn being the principal crop, although some cotton is grown. Independence county is just on the northern edge of the cotton belt. The broad, flat low lands of the White river valley at its lower end is especially fertile. Batesville is at the western end of this low land region. Immediately to the west of the town the valley narrows rapidly, and as one proceeds still farther west the face of the country becomes very rolling and broken by numerous small water courses. This whole region perhaps can best be described as the Southern foothills of the Ozarks. Still farther north, the White river valley becomes more rugged, the bluffs more prominent, the waters become crystal clear with numerous rapids, with an abundance of vegetation—mostly oaks, scrub cedar, vines and various grasses. It is without a doubt one of the most beautiful regions in the United States.

One of the first commercial lime kilns in Arkansas, built in 1887, with an 1891 monitor kiln beyond

Besides limestone, there are two other minerals of commercial importance—manganese and bauxite—that are mined in the territory immediately north Batesville. The latter mineral is a hydrated aluminum oxide and is valued as an ore of aluminum [$Al_2O_3 \cdot 3H_2O$]. Small stringers of copper, lead and zinc ores are found scattered through the limestone areas, but are not of commercial interest.

The gray, cherty, limestones of the Batesville series are quarried in small amounts for structural purposes and here and there along the railroad can be seen small plants getting out structural and decorative stone for local use. The marbles from these quarries compare very favorably with some of the better known stones as regards crushing strength, moisture absorption, etc.

Historical

At Denieville, a few miles northwest of Batesville, the lime industry dates to 1887, and here is one of the oldest commercial lime plants in the state. Previous to 1891 lime was burned in a stone kiln, 25 ft. deep and 5 ft. 5 in. in diameter, which had a daily capacity of 90 bbl. of lime. In 1891 a new "Monitor" kiln (Sandusky, Ohio) was erected, which had an iron shell and an internal diameter of 4 ft. at the top, and 6 ft. at the bottom, with a depth of 30 ft., exclusive of the stack and cooler. This kiln brought the daily production up to 180 bbl. per day.

The ruins of these two kilns still stand; and the old Monitor kiln, aside from the difference in size and a few mechanical improvements, bears marked similarity to the more modern kilns.

One of the old monitor-type kilns at Denieville, Ark.

The limestone for these kilns was hauled six miles over dirt roads by wagons and mules. The total cost of production is given at 60 c. per bushel and 80 c. barreled.

Present Operation

The operations of the Batesville White

Cordwood storage at the Batesville plant. Note the heavy timber growth behind, typical of this region

Lime Co. started in 1907 at Ruddells, Ark., a small town on the Missouri Pacific railroad some 40 miles north and west of the present plant at Batesville. At Ruddells, the limestone is quarried from what is locally known as the St. Claire marble. The U. S. Geological Survey classifies it as the Fern-

A section of the quarry, illustrating the absence of overburden

dale marble. This stone chemically is a high calcium limestone, but produces a dark lime, which has high qualities for structural purposes, but is not desirable for hydrate on account of its color. The Ruddells plant is still in operation and consists of four wood burning kilns that produce 50 tons of lime per day. It is the intention of the company to continue the operation of this plant until the supply of cheap stone is exhausted, which George T. Weigart, president and general manager, states will be some 10 years hence.

In 1917, the demand for hydrated lime in the territory served by the company reached such proportions that it was either a case of going into the manufacture of hydrate or going out of the lime business. Accordingly the board of directors of the company authorized their president, Mr. Weigart to investigate the limestone areas of northeastern Arkansas to try and locate a high calcium, white limestone. This investigation, based on the state geological report (Arkansas Geological Report, Vol. 4, 1890, Dr. John C. Branner, state geologist) on the marbles and limestone areas of Arkansas, covered a scope of territory from the White river valley to the Missouri state line. No work was done outside of this area on account of lack of railroad facilities.

Another view in the quarry, showing the type of quarry equipment used

After spending, in all, about four years, during which time all of the limestones of the region were thoroughly investigated, the deposit at Limedale, Independence county, was selected. The basic reasons for this selection were: *First:* On account of the chemical and physical properties of the raw material; *Second:* The accessibility to railroad transportation.

It is interesting to note that the idea of investigating this particular region was gained through Branner's report, in which mention is made of a well being drilled, during Civil War days, to a depth of 134 ft. and still in limestone. No water was reached in this particular hole, as experience in this territory teaches, that owing to the many fissures in the strata, a sure supply of water can be secured only after the limestone has been penetrated. The deposits at Limedale are roughly eight miles northwest of the town of Batesville.

The holdings of the company are not confined to this one deposit, as they own or control about 3500 acres of timber and limestone land. Several tracts are in Independence and Izard counties.

Another feature of interest is that these deposits at Limedale were recently worked as a dimension stone quarry by the Bates-

Loading in the quarry. Note the geological formation of the face

ville Marble Co. The state capitol at Little Rock, Ark., a $1,500,000 structure, was built with this stone.

Geological Formation

Before this site was purchased the tract, consisting of 400 acres, was thoroughly core drilled and analyses made of the cores every 5 ft. of vertical depth. This drilling revealed a stratum of remarkable limestone both as to depth and purity—an average depth of 198 ft. of stone that did not vary over 0.25% in its composition, and with an average calcium carbonate content of 99.34%. This stone is found in what is known as the Boone chert formation, but the limestone is absolutely free from chert or other silicious materials.

Dr. Branner classifies the rocks of northern Arkansas as belonging entirely to the Paleozoic system and to the Lower Carboniferous series. The local geographical name given to the area under discussion is the

Looking along the tops of the kilns, showing the one in the foreground just being started. Note the brush charge

Boone cherts and limestones of the Osage group.

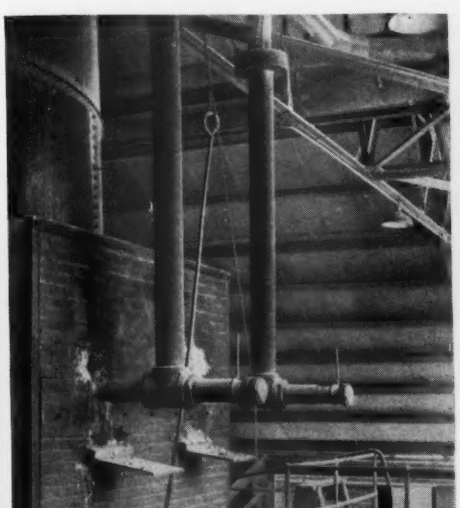
The limestone is described as a semi-oolitic stone, a dense, fine grained, crystalline, hard and brittle; and under the microscope the openings between the particles have spherical shape, and it is probably from this peculiar structure that the name semi-oolitic is derived.

The lime kilns of the Batesville operation are located on a branch road of the Missouri Pacific, a short spur some 10 miles long serving the districts of Denieville, Big Springs and Cushman. The quarries are about three miles from the lime plant in a northerly direction, but are not located on this railroad. The company has a narrow-gage railroad of its own for transporting the rock to the kilns.

Looking out through the eye of a kiln undergoing repairs

Power and Water Supply

Power is purchased from the Arkansas Power and Light Co., which has a steam-



Charging pots of the gas producer, and the fire box

power plant at Sterlington, Ala., a hydro-electric project at Remmel Dam, near Hot Springs, Ark., and in addition a secondary Diesel-engine plant at Batesville. This line-up of power from three sources insures a steady and reliable delivery of power.

The power rate is very favorable to the company and as a result practically all of the operations are electrically driven. The exceptions are the haulage locomotives and quarry compressor.

Water for the hydrators and domestic use is secured from deep wells which penetrate the limestone. The water naturally is very hard, but as no boilers are used, except a small auxiliary, which will be described later, no water softening equipment is needed.

Power is delivered to the plant at 13,000 volts, 3-phase, and is stepped down to 440 volts for plant power purposes. Lights are on a separate 3-wire system, and are used at 110 and 220 volts. Roughly, about 250 hp.

The coal storage at the Batesville plant

are used in the hydrating plant and the kiln operation.

Fuel

The original kilns built at Batesville in 1924 were wood fired, using 4-ft. lengths of oak cordwood as fuel. Three of the kilns at this plant are still of this type. The other three are fired by producer gas.

The company expects to continue the use of wood for fuel for part of the production as they secure a premium for this soft burned lime, and as the company owns sufficient acreage of heavily timbered hardwood to supply the kilns for some 50 years (they figure this species of oak reforests itself to cordwood size in 25 to 35 years), considerable expansion can be taken care of without purchasing additional timber land.

The coal used for the gas producers is a low sulphur, gas coal from the Franklin county, Illinois, field. The west Kentucky

and Birmingham, Ala., coals are also used at times.

Some trouble was experienced at the outset of the gas-fired kilns from large clinkers forming in the fire boxes of the producers. This condition was traced to dark colored fire clay in the coal used, and when clean coal was substituted no more trouble was experienced.

Owing to the necessity of getting a more complete burning, which would require a higher kiln temperature and still maintain production tonnage, the company in 1928 added three more gas-fired kilns. A harder burned lime, to meet the demands of the chemical trade, was the reason for this change. It was not the scarcity of wood fuel that caused the introduction of the producer gas kilns, but a desire on the part of the management to more accurately meet the demands of the trade for a special kind of lime.

It has been found that roughly one ton of coal is equivalent to two cords of wood. Mr. Weigart states that the coal used has an actual heat value of 12,500 B.t.u. per pound, although the coal is supposed to have a value equivalent to 14,500 B.t.u.

At the time the plant was visited C. H. Anderson, combustion engineer of the Royalton-Energy Coal Co., of St. Louis, was making an investigation for Mr. Weigart, with the idea of increasing fuel efficiencies, etc.

Markets

The market served by the Batesville Lime Co. extends from the Mississippi river, on the east, to Denver, Colo., and New Mexico, on the west; from Nebraska, Iowa and the Dakotas on the north to the Gulf of Mexico on the south. The chemical properties are such as to permit shipments to such a large trade territory.

When the lime is used for foodstuffs and their preparation an arsenic-free lime is needed, and the wood-burned lime from this plant easily meets these rigid requirements, and is in much demand for that reason.

The capacity of the plant is 150 tons per day, and of the Ruddles plant 50 tons per day. About 20% of the sales are of hydrate. No ground limestone is sold, although the company used to sell that product.

About 25% of the output of the company goes for building purposes and the balance is used in the various chemical and food industries.

Quarrying

Only a small amount of stripping is necessary, consisting of a few inches of top soil, which in some cases may reach a foot in depth. This overburden is mostly removed with team and scraper, and the balance is shot down into the quarry and removed with the spalls.

Primary drilling is done with Sullivan, sinker type, air drills. The holes, 25 ft. by 2½ in., are drilled at 8-ft. centers and 8-ft. burden. The charge consists of 30% gelatin dynamite to within 2 ft. of the surface, tamped with dry stemming. Owing to the brittle nature of the rock and the numerous horizontal bedding planes, the amount of powder used per ton is negligible, running only a few cents per ton of rock. Any blockholing necessary is done by Sullivan jackhammers.

The kiln stone is sledged by hand to one-man size, being very careful to secure an even sized stone for the kiln operations.

A small tonnage is shipped crude for flux, but as there is no market at present for crushed stone the spalls are wasted.

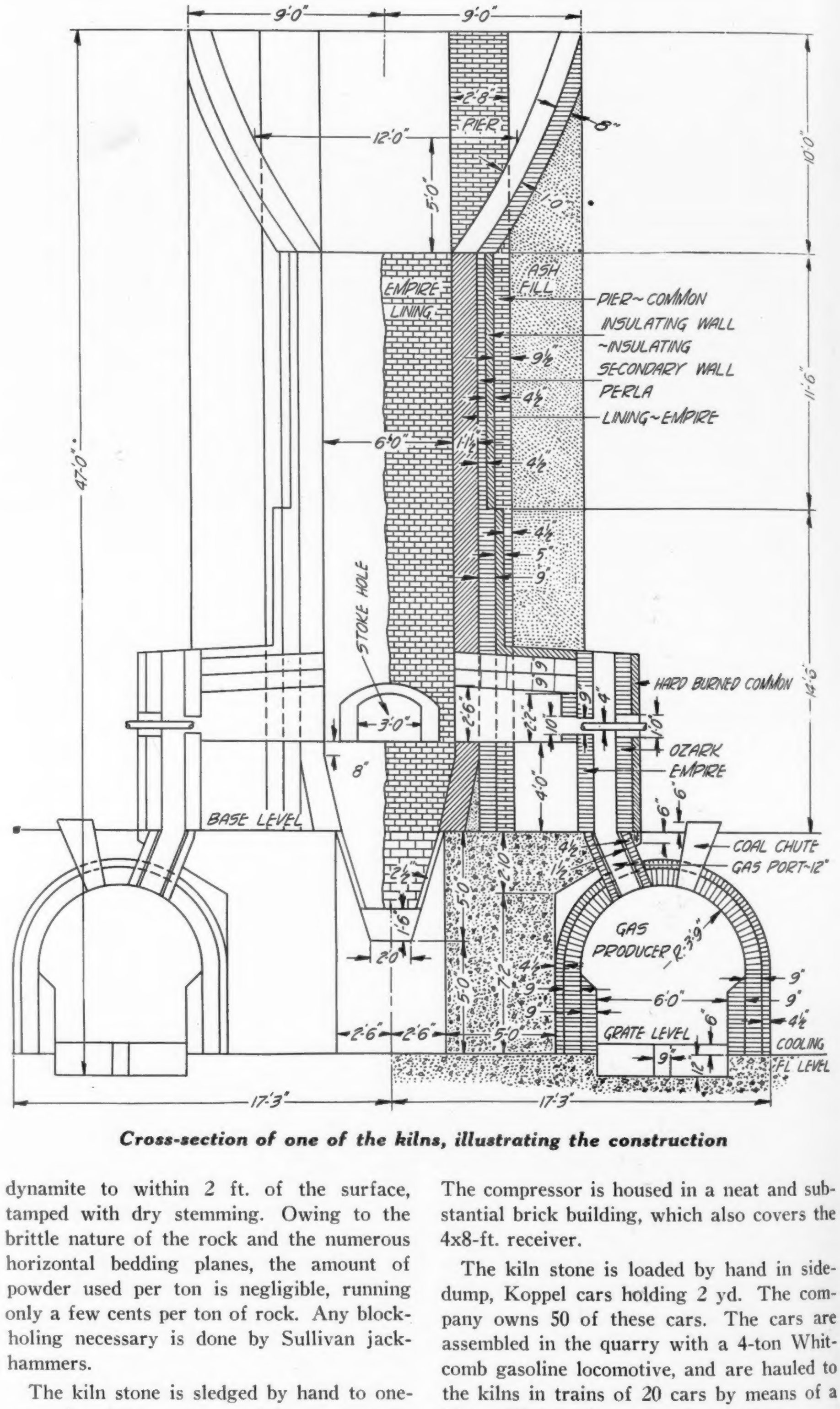
With the increased highway construction program that the state of Arkansas is undertaking, the management hopes ultimately to dispose of a considerable tonnage for this purpose.

Air is supplied to the drills at the quarry by a Chicago Pneumatic Tool Co. compressor, 7¾x12-in., direct-connected to a semi-Diesel, horizontal, single-cylinder engine. The compressor is housed in a neat and substantial brick building, which also covers the 4x8-ft. receiver.

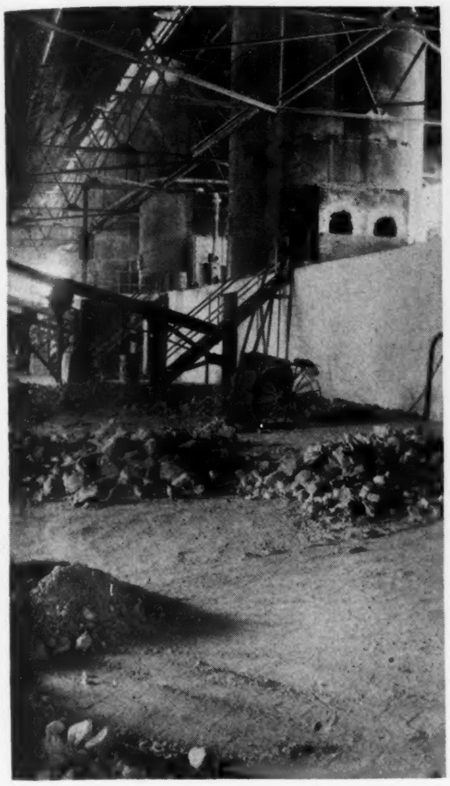
The kiln stone is loaded by hand in side-dump, Koppel cars holding 2 yd. The company owns 50 of these cars. The cars are assembled in the quarry with a 4-ton Whitcomb gasoline locomotive, and are hauled to the kilns in trains of 20 cars by means of a 16-ton Whitcomb gasoline locomotive.

Transportation to the plant is over three miles of 36-in. gage industrial track using 56-lb. rail throughout.

Before this three miles of track was built Mr. Weigart had a survey made with the intention of building a standard-gage track. The estimated cost of this installation was close to $180,000. Advice was plentiful not to install 3-ft. gage track in such a region. After four years of operation it has been found that the per ton-mile cost, including depreciation and maintenance on track and rolling stock, is 3c. The installation cost



Cross-section of one of the kilns, illustrating the construction



General view of the interior of the plant showing first kiln under repairs

Draw-gate on wood kiln

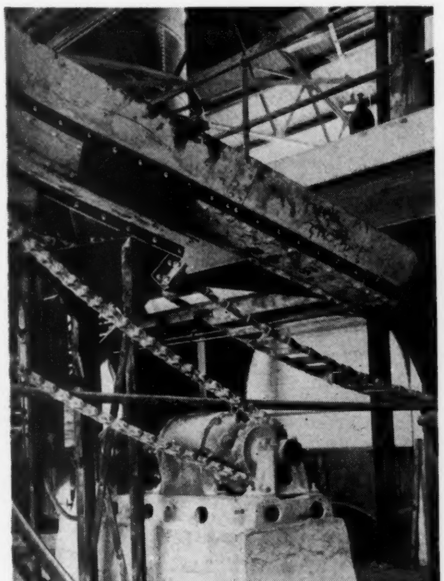
The discharge end of one of the mechanical drag conveyors

was about $50,000 in round figures.

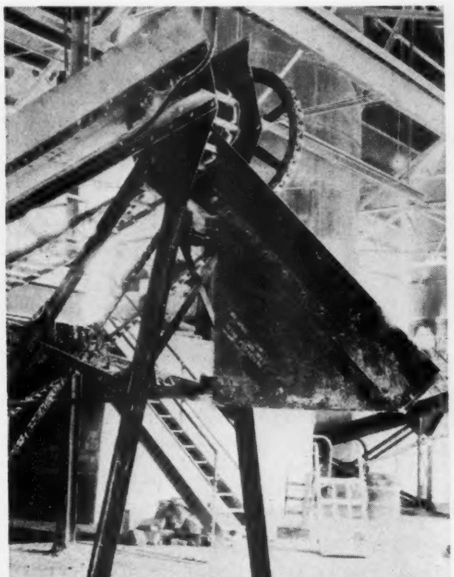
This low operating cost is mostly due to the engineering ability exercised in laying out the right-of-way through the semi-mountainous country, and the care used in subsequent construction of the roadbed.

Owing to the topography of the country the plant was so located that the train of 20 cars runs directly over the kilns and the stone is dumped into them without re-handling either the cars or the stone.

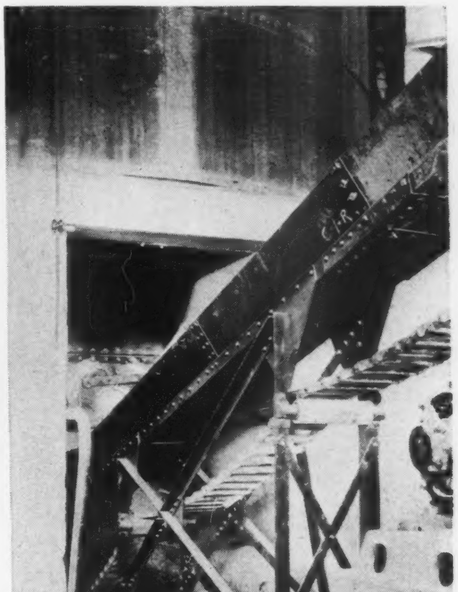
A new repair shop is being built at the same elevation as this track, and rock cars or engines can run directly into the shop for repairs. All quarry drill steel will be sharpened in this shop by a Sullivan drill sharpener. Air for operation of the sharpener is



The drive for the mechanical drag conveyors



Discharge end of mechanical drag chain conveyor for unloading the kilns, with spreader apron attached



The loading end of the drag conveyor

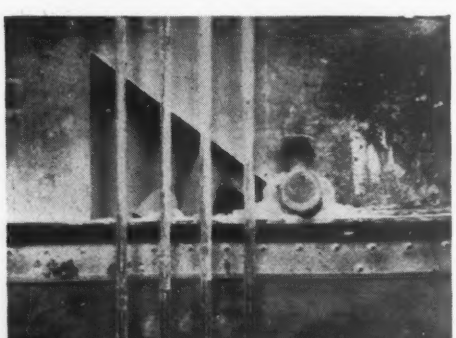
Electrical recording instruments for controlling the kiln operation

supplied by a Sullivan 8x8-in. compressor running at 286 r.p.m. and belt-driven by a 20-hp., 1150-r.p.m. Ideal electric motor.

A detailed description of the kilns is omitted, as the accompanying cross-section shows their construction.

Wood Kilns Have Advantages

Repairs necessary to the wood-burning kilns are very infrequent. All three of the Batesville kilns have been in continuous operation for the past four years, and only this summer was it found necessary to make minor repairs to the brickwork in the heating zone. Examination of the firebox and shaft of a kiln being overhauled showed the interior to be in remarkable condition, considering the time it had been in service and the tonnage it had produced. No doubt more tonnage could have been put through this kiln, but the superintendent, C. B. Teague, believes in keeping the plant always in first-class mechanical condition.



The push-button electric switches which control the entire plant

The method of starting these kilns is to lower about five cords of wood into the kiln and the balance of the shaft is filled with brush, after which rock is dumped directly on to the filling. The wood is then fired and additional wood is burned in the regular firebox for 36 hours, after which time the wood ashes are drawn. After an additional 12 hours lime is drawn from the hopper below, and the firing is continued through the four fire doors. Two doors are on each side. As the wood burns out, allowing the charge to work downward, additional rock is dumped into the kiln as needed, until finally the entire charge is stone.

A total of 16 cords of wood are required to start a cold kiln and get it to the producing stage, at a cost of $64. Wood costs $3 per cord in the yard and $4 delivered at the kiln.

The wood kilns have an actual daily capacity of 16 tons, and this tonnage is partly due to the installation of a shaking grate. This grate is known as the Thomas W-S-D and is manufactured by the Thomas Grate Bar Co., Birmingham, Ala. When asked what W-S-D stood for the writer was advised, for "wiggle-shake-dump."

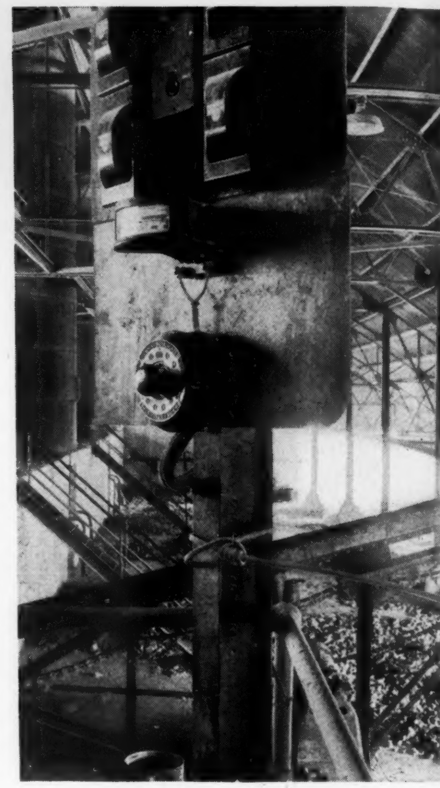
This grate consists of elliptical, perforated bars so designed that they may be hand-shaken by means of a lever. It is claimed that by their use a more even fire can be maintained, and that they serve to regulate the intensity of the heat on any particular side of the kiln. These grates have been in use for about three years, and from their appearance their life has hardly begun.

Pyrometer Control of Gas Kilns

The three producer gas kilns were designed for a daily production of 24 tons each. Actually, though, as high as 51 tons per day has been produced per kiln. This production developed such high temperatures that there was a tendency to fuse the refractory linings, so the tonnage is now held at 35 tons per kiln.

This tonnage is maintained by careful selection of a uniformly sized stone (the stone does not readily crush in the shaft) and by accurate and absolute control of the temperatures in the kiln by the use of both indicating and recording pyrometers. Another feature that has been of material assistance in bringing up the per kiln tonnage is the use of mechanical means of drawing the burned lime.

In the plant office are located three Brown



Indicating pyrometer and 12-point electric switch

recording pyrometers, which record two readings from each of the gas-fired kilns. In addition to the recording instruments, a Brown electrical indicating pyrometer, equipped with M A couples, and with a temperature range of 0 to 2000 deg. F., is located on the firing floor near the No. 3 kiln. The hot points for these pyrometers are located in front and in back of the gas kilns, and at a point 9 ft. above the grate level.

Actual Temperatures

The temperatures as recorded by the control pyrometer on the gas-producer fired kilns range from 1700 deg. F. to 1880 deg. F., giving them actual temperatures of from 2400 deg. F. to 2580 deg. F. in the hot zone.

Because of the very nature of the process of lime burning in shaft kilns it was only possible to obtain a relative temperature as the thermocouple cannot be introduced directly into the hot kiln. For practical purpose two locations in each kiln was selected and the thermocouples encased in a special tile built into the lining wall. The point of the thermocouple extends to within about 2 in. of the inside of the wall and is protected from plugging by the lime lime by refractory plugs in the ends of the tile.

It was necessary to determine the ratio of temperature in the actual hot zone to the

The office of the Batesville company at the quarry

temperature in the walls by the pyrometers located at those points. To determine this a portable thermocouple was used wtih a special long stem and between draw periods, when the mass of lime in the kiln was stationary this thermocuple was introduced into the hot zone and a comparison of readings made, and in this case a difference of 700 deg F. was noted for a large number of readings extending over a considerable period of time.

It is quite common practice to have the thermocouple protected from the descending lime by locating the tip back a few inches into the kiln walls and separated from the fire zone by a few inches of brick or other refractory material, but we believe this plant to be one of the first to actually measure the temperature in the hottest part of the kiln itself, by inserting the couple into the burning lime.

The temperature of the gas kilns and the wood kilns as well can all be read from the indicating instrument by means of a 12-point switch. Only the gas-fired kilns are connected to the recording pyrometers.

By the use of these pyrometers it is possible to tell accurately the temperature within the kiln and the condition of the charge in the hot zone can be seen at a glance. In the event of unsatisfactory temperatures corrective measures can be taken at once. There is no guesswork about it. In addition the recording instruments leave a daily record of the kiln temperatures.

Coal and Lime Handling

Coal for the kilns is unloaded by hand from gondolas, the track running parallel to the kilns, and is piled at handy intervals for charging to the individual producers. Coal charged to the producers is first weighed in wheelbarrows on Fairbanks-Morse (1000-lb. capacity) platform scales. A careful record of all coal burned is kept by the firemen.

On the lime-cooling floor is kept a portable Ingersoll-Rand, Type 20, 10x8-in., gasoline-driven compressor, which is used to supply air for burning out the carbon and soot that collect in the eye of the kiln. This carbon is burned out at regular intervals of four hours.

Air is forced into the kilns above the gas inlets, as shown in one of the views. This air is supplied by two Sirocco fans, made by the American Blower Co., their size being 3½, Type A-1854. These two fans are so located that they may, in an emergency, be driven by a small, one-cylinder, vertical type, steam engine and boiler which are immediately below the fans. They are connected to this steam engine by a belt which hangs idle when the fans are being driven by the electric motors. The motors here used are 3-hp. Ideal, 1730 r.p.m., driving the fans at 580 r.p.m. by means of a Texrope drive on 13-in. centers. It is very essential to keep these blowers in operation while the producers are being used, hence the auxiliary steam engine in case the electric power fails.

The air passes from the blower through a 24-in. header of 8-gage iron, which gradually reduces to 10-in. diameter at the farthest kiln. From this header the air passes to each side of the kiln through an 8-in. pipe and just before reaching the firebox divides into two 6-in. standard pipes.

Mechanical Kiln-Drawing Device

The lime is drawn from twin cooling chambers by hand-operated gates which discharge into a steel hopper. This hopper is riveted to the conveyor frame and is emptied by means of a mechanical drag conveyor. This conveyor elevates the material to sufficient height that when it falls to the cooling floor the cone of the pile thus made is below the lip of the discharge apron. On one of the drag conveyor's discharge aprons has been installed a movable spout, by means of which three small piles can be built, thus giving a larger cooling area.

Once the flow of material has started from the kiln there is no occasion for stopping until the proper amount has been drawn, and it has been found that there is far less likelihood of the kiln "hanging up" under this steady withdrawal.

Before, with carts, one hour was required to draw a kiln, and during that time the fire was shut off. Now the kilns are drawn on an average in ten minutes or even less, and the fire is not cut off during the operation.

This mechanical drag was designed by Mr. Weigert and manufactured by the Montgomery Coal Washing and Manufacturing Co., Birmingham, Ala. Power is supplied to each conveyor by a 10-hp. Ideal electric motor at 1750 r.p.m., direct-connected to a Jones spur-gear reducer, which drives the head pulley by chain and sprocket.

The three gas-fired kilns were first equipped with these unloaders, which proved so successful that one was installed on a wood-fired kiln. Here it has proven its worth and the remaining two wood kilns are to be equipped. There was some doubt at first as to the advisability of using the unloaders on the wood kilns on account of the narrow space in the draw tunnel.

The lime remains on the fire-brick cooling floor, until cooled sufficiently to be coopered, loaded in bulk or sent to the crushing and hydrating plant. Bulk lime is loaded direct into cars by wheelbarrows, box cars being spotted on the track parallel to the plant. There is room for 11 box cars on this track.

Crushing and Hydrating Plant

The cooled lime is conveyed by wheelbarrows to the crushing and hydrating plant, which is situated at the west end of the building. Here it is dumped into a single-

MOTOR SCHEDULE

Machine	HP.	Type of Drive	Speed, Full Load	Centers, Inches	Speed Driven	Kind of Control
Crusher	20	Texrope	1150	53.1	200	PB 8537[1]
Hydrator	10	Texrope	690	66.0	100	PB 8537
R. M. Fan	60	Texrope	1150	46.0	1300	Hand 2205
Raymond Mill	10	Texrope	1150	44.5	400	PB 8537
Rolls	5	Belt	1140	......	......	PB 8533
Elevator No. 4	7½	Texrope	875	35.0	120	PB 8537[2]
Elevator No. 1	5	Belt	1140	......	......	PB 8537[3]
Kiln Unloaders	10	Jones	1750	......	......	PB 8537[4]
Cooperage	5	Belt	1730	......	......	PB 8532[5]
Fan (Gas)	3	Texrope	1730	12.8	580	PB 8532

PB = Push button.
[1]Starters made by International Controller Co., Milwaukee, Wis.
[2]From roll crusher to vibrator screen.
[3]Gyratory direct to conveyor which loads storage bin for feeding hydrator.
[4]Separate motor on each unloader.
[5]Same equipment used on deep-well, water pump.

roll crusher (Sturtevant, Size O) and reduced to 2-in. size. The material is then elevated in a steel bucket elevator (6x4-in. buckets) to the top of the building and passed over a set of Sturtevant vibrating screens, where the ½-in. and fines are returned by a spout to the No. 1½ Sturtevant rotary crusher, where the product is reduced to ⅛ in.

This crusher is driven by a 20-hp. motor with a Texrope drive. This type of drive, which is very well adapted to short center operation, in this case has the motor pulley 6 in. in diameter driving a 42-in. pulley on 53-in. centers. Actually the Texrope drive here used is for a 10-hp. motor, but is easily pulling the 20-hp. load.

The material from the rotary crusher is again elevated in a steel bucket elevator to a short conveyor which takes the quicklime to steel storage bins and from these bins the lime is fed to a Kritzer continuous hydrator. The hydrator is driven by a 10-hp. Ideal electric motor, 750 r.p.m., by means of Texrope, drive, on 66-in. centers, reducing the speed to 100 r.p.m. Both the elevators and conveyors used in this plant were supplied by the H. W. Caldwell and Sons Co. On the platform occupied by the hydrator operators are a series of push button switches that control the operation of the entire hydrating plant.

From the hydrator the material is conveyed by a short screw conveyor to a Raymond mill (No. O), driven by a 10-hp. Ideal electric motor running at 1150 r.p.m. by means of a Texrope drive on 44-in. centers. The mill runs at 400 r.p.m.

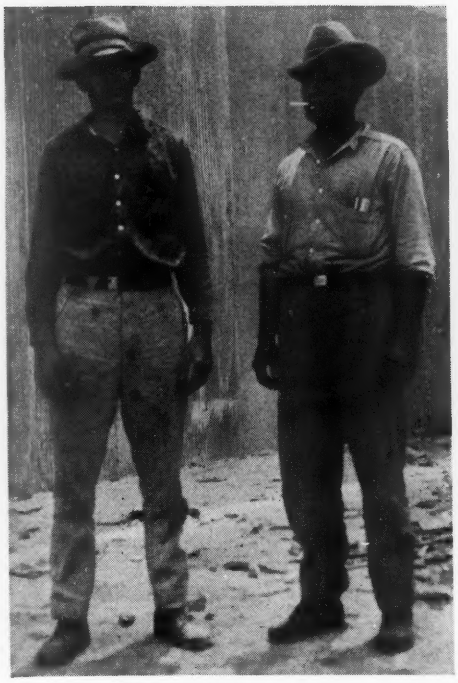
The Raymond mill fan passes the finely ground hydrate to a cyclone dust collector equipped with tubular dust filters. This fan is driven by a 60-hp. Ideal electric motor, 1150 r.p.m., which steps up the fan to 1300 r.p.m. by a Texrope drive on 44-in. centers. From the collector the material falls to a 15-ton, steel, storage tank, directly over the 4-tube Bates packer. The air separation features are carefully regulated so as to give a standard of quality of 99.0% minus 200-mesh. The hydrating plant has a capacity of 4 tons per hour.

The 4-tube Bates packer is driven by Ideal electric motors, direct-connected, and running at 870 r.p.m. Spill from the packer falls through a ⅜-in. grizzly to a 4-in. screw conveyor, which returns the spillage to the Raymond mill.

The hydrate is packed in paper, valve bags. A 50-lb. size for structural purposes, a similar size for chemical use, and a 10-lb. domestic size.

Oversize from Vibrating Screen

The 2-in. oversize from the vibrating screen drops into two steel tanks of 3000-bbl. capacity each. These two tanks feed the two Howe barrel packers, directly under the bins. These packers are used to fill standard 180-lb. barrels and 90-lb. moisture-proof, paper-lined, jute bags. The Howe packers are driven by a 5-hp. motor from a short countershaft.



R. H. Godwin, engineer, and G. B. Teague, superintendent, at the Batesville plant

Cooperage Plant

The company operates its own cooperage plant, but purchases staves, hoops and headers in carload lots. Kiln-dried ash is used for staves and southern pine for heads. Flat, steel hoops are purchased and expanded on a hoop expander made by W. M. Clader, Chicago. The hoops are bradded on a bradding machine made by E. B. Holmes, Buffalo, N. Y. Both these machines are driven by a 5-hp. motor from a short countershaft.

Miscellaneous Equipment

Insulated brick supplied by the Armstrong Cork and Insulating Co., Pittsburgh, Penn.; fire brick and fire clay by A. P. Green Fire Brick Co., Mexico, Mo. High alumina brick ("Kruzite") are used in the burning zones of the kilns. The structural steel was fabricated by Arkansas Foundry Co., Little Rock, Ark. The castings, coal hoppers, etc., were made by Standard Brake Shoe Co., Pine Bluff, Ark. Steel tanks and kilns were supplied by the Kaw Steel Construction Co., Kansas City, Mo.

Personnel

The operating officers of the company are: George T. Weigart, president and general manager; L. E. Smith, assistant manager; C. B. Teague, superintendent; R. H. Godwin, engineer; Leo F. Smith, accountant. Executive officers are: W. W. Fisher, chairman of board, Memphis, Tenn.; W. N. Fry, vice-president, Memphis, Tenn.; H. R. Case, secretary, Batesville, Ark.; George R. Case, treasurer, Batesville, Ark. The main office of the company is at the quarry. A sales office is maintained at Little Rock, Ark.

Wisconsin's Granite Paving Block Industry

A 150-FT. PIT yawns in the heart of Red Granite, Wis., where once stood a 50-ft. hill of solid granite. The huge outcrop succumbed long since and the pit is the result of 39 years of quarrying.

The Red Granite quarry of the Wisconsin Granite Co. is one of six quarries along the granite ledge which runs, with occasional outcrops, about six miles from here to Glen Rock. From 1912 to 1915, the peak years of the granite paving block industry in Wisconsin, all six quarries operated, with a total of about 1500 employes.

The advent of pneumatic tires and the widespread use of concrete for paving have dealt this industry a blow from which it probably never will recover. The steel tires of brewery wagons and heavy drays, which only the hardest of wearing surfaces could withstand, have given place to rubber tires.

Two Are Abandoned

The quarries have suspended operations. The Wisconsin Granite Co. still operates the one here and another at West Point. The Universal and the Waushara Granite Quarries companies each run one quarry. The Wisconsin Granite Co., according to William Wiske, superintendent, has less than 300 men on its payroll at the two quarries, and the other two quarries probably fall short of that number.

The Red Granite quarry is turning out 12,000 to 15,000 paving blocks a day. In addition, it produces fine monument granite, rough two to five ton blocks for projects such as the Milwaukee breakwater and crushed granite, for use in vibrolithic concrete and other purposes.

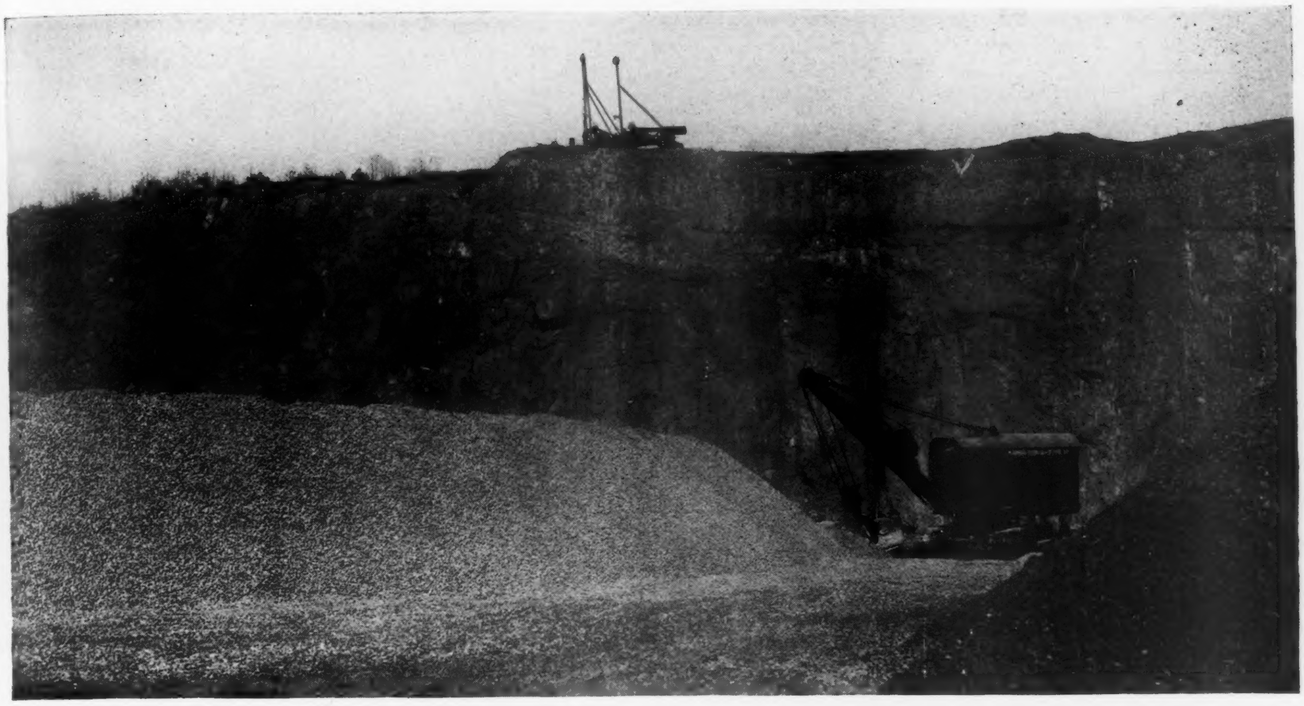
The granite paving block business is confined largely to repairing and widening existing pavements of granite block.—*Milwaukee* (Wis.) *Journal.*

New San Francisco Gravel Distributors

FRANK C. HATCH, San Francisco, Calif., announces the opening of a series of building material yards to supply the trade in what he believes is a revival of interest in construction as well as a forecasted increase in road construction. The first yard to be opened is located at 1755 San Bruno avenue. Others will be opened at regular intervals later.

Mr. Hatch, who was formerly president of the State Sand and Gravel Association, is president and general manager of the new "Triple A" firm. Other officers are Robert E. Hatch, secretary; R. Marvin Greathouse, vice-president and treasurer; Ray H. Montague, second vice-president.

Messrs. Greathouse and Montague are both practical gravel men, having been connected for some time with this important branch of construction activity.—*San Francisco* (Calif.) *Examiner.*



A view in a Connecticut quarry where the well-drill method of blast-hole drilling is followed

Quarrying Practices*

Descriptions of Bench, Well-Drill, Snakehole and Coyote Methods

By S. R. Russell

THERE are many kinds of quarries in this country, but only those which produce crushed stone for commercial purposes, and hence use explosives to any extent, will be considered here. These embrace all the many varieties of limestones down to the traps, granites and sandstones.

Enormous quantities of these materials are produced and used in this country annually and the consumption steadily increases from year to year. The automobile perhaps has been the most potent factor in bringing about this increase. Its use has fostered the building of improved and paved highways and this building has been going on at a tremendous pace in recent years. This kind of work calls for vast quantities of crushed stone, cement and other materials. The automobile industry itself is probably the largest user of steel and steel products. Vast quantities of limestone are used every year by the steel industry as blast furnace flux.

Powder Cost in Quarrying

In order to get out these materials, explosives are absolutely necessary. It is estimated that about 90,000,000 lb. are used annually in quarries of different kinds in this country. So it will be seen that the explosive question enters vitally into the cost of production. Generally speaking, the explosive cost per ton of stone produced represents from 10 to 15% of the total cost, and next to labor it is the greatest item in the process.

There are four general methods of working a quarry face: Benching, snakeholing, well-drilling and the coyote or tunnel method. Which one is best suited for any particular quarry depends upon the character of stone, its stratification, thickness of vein, proposed use and the operator's preference.

For a number of years now the churn drill or, as commonly called, the well-drill method, has been accepted as the most efficient and modern one of drilling and blasting. In earlier days we depended upon the so-called tripod drill, a piston-driven machine operated by air or steam, to put down holes, and later the hammer-type machines.

Changes in Drilling Practice

In those times hand labor was usually employed for loading stone in quarries. It was necessary, of course, to break the stone in sizes easily handled and lifted into a car by one man. Therefore the use of many and smaller holes was necessary, and the limitations of the depth to which the holes could be drilled by the tripod machine compelled the use of the bench system. This means working a face of rock in one or a series of vertical steps or benches—hence the name. In high faces often six or more benches were necessary. Then, as the demand for stone increased and labor costs mounted, came the use of power shovels for loading stone. The first shovels were operated by steam and moved about on rail sections a few feet at a time. In ordinary single bench blasting it was impossible to keep enough stone down in front of the shovel, which meant moving it frequently, lifting and laying tracks, and so on. The time thus expended amounted to a great deal during the day. Then the development was in the line of higher banks or faces, shooting several benches at a time. While this brought down more stone and lessened the moves, the shovel was handicapped greatly because it could not dig to the bottom and back of the bank of stone. Besides, it required a lot of hand labor to clean the benches before they could be redrilled, for much of the stone from previous shots remained on them. Operating these multiple benches was precarious during the winter when snow and ice abound.

Then the churn drill came into favor and it apparently has held first place ever since. This machine, which drilled holes the full

*Reprinted from *The Du Pont Magazine* of E. I. du Pont de Nemours & Co.

depth of the face, permitted wider spacing of the holes, eliminated bench cleaning and the dangers attached to climbing about on them, and assured greater volume of stone on the quarry floor, so that less frequent shovel moving was necessary. But when well drills replaced the tripod machines, the stone, as a rule, was brought down in bigger blocks, which meant that they must be redrilled and blasted before the shovels could dig them, or if they could be handled, so that they would fit the crusher openings.

Effects of Changes in Drilling Practice on Crusher Building

At this time few plants were equipped with crushers big enough to take a stone of the size that would go through a shovel dipper. For a long time the No. 9 gyratory was the largest in use, and there were few of these. So it was realized that the next move was to get larger crushers, and the development along this line has been very rapid. We now have jaw crushers with openings 66x84 in., and gyratories known as No. 60 crushers which will take stones of several tons weight. This larger equipment contributed greatly to the success of the well-drill method of blasting, as everything harmonized—well drills, power shovels and large crushers.

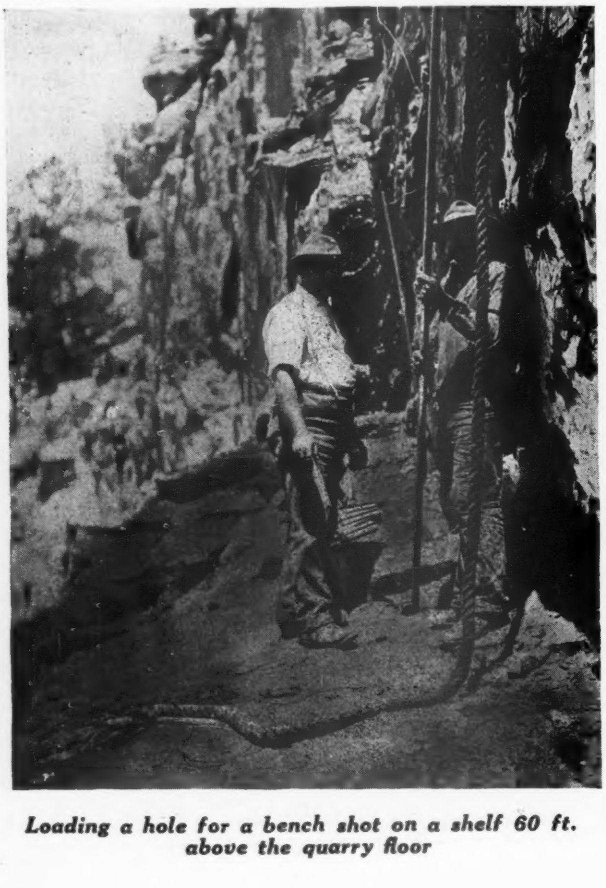
Well-drill holes may vary from 4 to 8 in. in diameter. The most common in use is the 5⅝- or 6-in. hole. Much has been said and written about the method of loading this kind of drill hole and nothing particularly new has developed in recent years.

It is customary to load the bottoms of holes with a high-strength, high-density explosive, such as gelatin, and a lower strength, more bulky explosive along the column in order to get better distribution of the explosive at least cost. I shall not attempt at this time to cover the detailed procedure followed in loading well-drill holes. This has been done so long and is so well known and understood that it is probably unnecessary.

Preparing for a well-drill blast, showing the large size of the dynamite cartridges here used

Correct Drilling the Most Important Factor in Successful Operation of Quarry

There is nothing so important as drilling in a quarry operation. Successful results cannot be obtained from the blasting unless the drilling is properly done. In my experience I have found that in the majority of cases where poor results are claimed in blasting, the source of all the trouble was poor or improper drilling. With well-drill holes it is especially important that the holes be drilled to proper depth below the floor level. This should not be left to guesswork by the driller. In any quarry it is advisable that a system of levels be run with an engineer's instrument and bench marks established on the top of each bench to indicate the exact elevation with reference to the quarry or loading floor. These bench marks can be used as permanent reference points for the placing of stakes in the future. These stakes should be set at regular intervals around the quarry and far enough back to prevent disturbance, and each stake should be marked with the cutting at that point to indicate to the driller the depth of hole. This method of assisting and checking the drill crew I have found, in many quarries, to have solved very serious trouble arising from short holes and consequent failure to pull the bottoms. Naturally, if the bottom does not come out it means many hold-ups for the shovel, much secondary drilling and blasting. In short, it reduces the output and increases the cost.



Loading a hole for a bench shot on a shelf 60 ft. above the quarry floor

How Far to Sub-Drill a Quarry Floor

The following table gives what I think should be the depth of sub-drilling in faces up to 200 ft. high unless there is a natural parting at the quarry floor, in which case little or no sub-drilling is needed.

Height of face	Sub-drilling
30 to 40 ft.	3 ft.
40 to 60 ft.	4 ft.
60 to 90 ft.	5 ft.
90 to 125 ft.	6 ft.
125 to 150 ft.	7 ft.
150 to 175 ft.	8 ft.
175 to 200 ft.	10 ft.

In well-drill hole blasting discussion often arises whether it is better to use two or three rows of holes arranged in staggered order, or a single row. Some think that better fragmentation is obtained by blasting multiple rows, and this is true. The vast majority, however, use the single row system. I am inclined to favor the single row when the face of stone is 50 ft. or over. If it is less than 50 ft. high, much depends upon local conditions and character of the stone. In relatively shallow faces, say, from 25 ft. to 40 ft. in height, often from two to five rows of holes are shot at one time, the idea being to gain sufficient volume of material to minimize the shovel and track movements. Often also this method is advantageous with shovels with long booms and wide digging radius. In higher faces, say, 70 ft. or over, multiple rows are very rarely used, because the back of the bank, when shot, is too high for efficient shovel operation, and the shovel may be endangered by slides of loose material.

Most Economical Height of Face to Work

There has been and still is considerable difference of opinion as to the most economical or efficient height of face to work with power shovels. Some think the higher faces best because the shovels and tracks need not be moved so frequently. Of course much depends on the size of the shovel in use and the kind of quarry. In many of our stone quarries which are side-hill operations the height of face is governed by the topography

of the ground. Often these faces may run from 100 to 250 ft. in height. There are very few quarries which could afford to operate two or more separate well-drill benches. Therefore in most cases we must accept conditions as they are, especially if the quarry has been opened and worked for some time. However, in certain sections, especially in the middle west states, most of the quarries are pits. The country is flat and any height of face can be obtained by sinking to any desired depth below the level of the surrounding land area.

The usual custom in this section is to carry the face not more than 40 ft. in height, and this seems to be the most economical for shovels up to 110-ton weight. Personally, I believe that a face of this height or even lower, especially since the introduction of caterpillar shovels, lends itself to easier and more economical operation than a higher one.

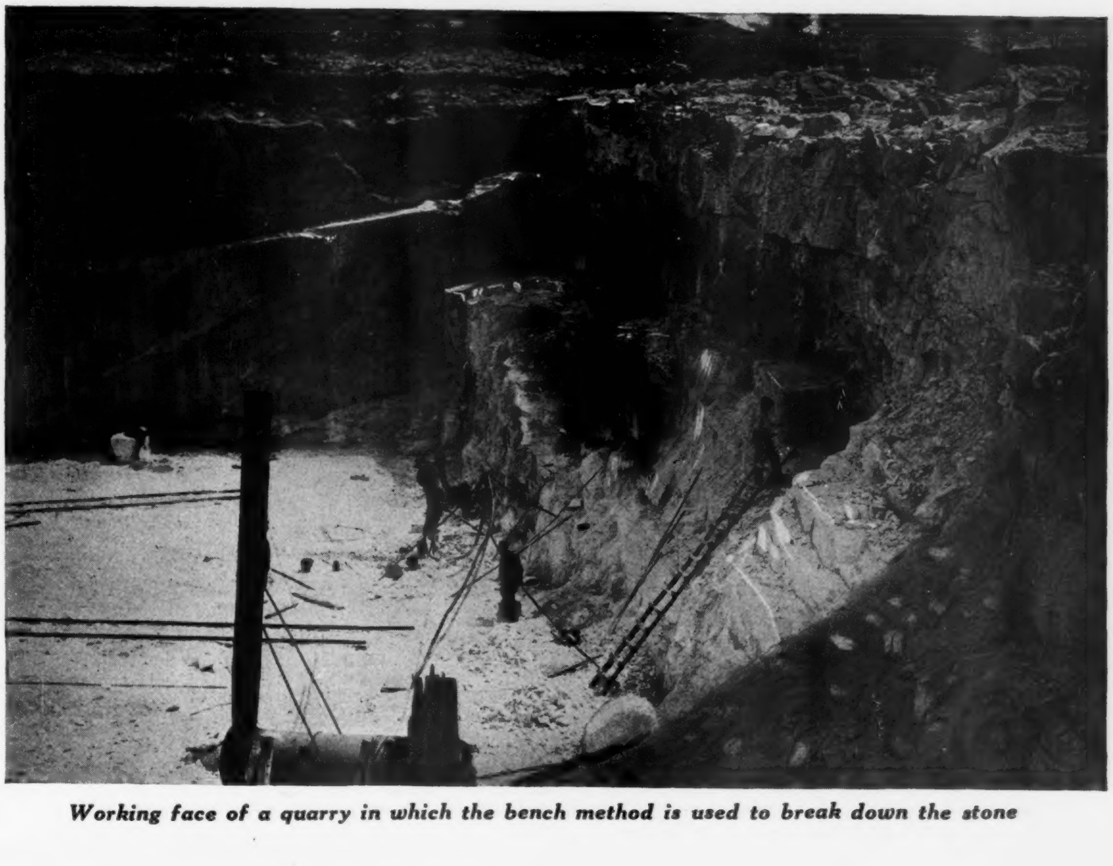
Technique of Blasting

When a whole or part of a shovel cut, or rather part of the material from a previous blast, is left against a face of rock to be shot down, it is called a "buffer" or "blanket" and is often referred to as "buffer blasting" or "carrying a buffer." The idea of a buffer is that it offers a greater resistance and tends to confine the force from the explosives so that better fragmentation is gained without throwing the rock too far out. It is necessary also to use a buffer and to shoot with care especially when the floor area between the track and face is limited. The position of the haulage track often is the controlling factor. I believe in a buffer for moderately low faces. Sometimes, however, too heavy a buffer is used and the stone does not come out far enough to permit easy access for the secondary preparation of the stone. This means frequent and costly hold-ups for the shovel, while the large stones, not found until uncovered by the shovel, are drilled and blasted. If the stone lies in thick, heavy ledges with open seams and has a tendency to slide out in large blocks before the explosive has had time to shatter them, it is better to use little or no buffer and allow the stone to be thrown out farther so it can be easily redrilled and prepared sufficiently ahead of the shovel. In higher faces, say, from 60 ft. up, no buffer whatever is used, nor is it necessary. Each blast is cleaned up before the material from another is thrown down.

There has been much controversy among quarry men recently as to the merits of the larger diameter holes, especially the 8-in. hole over the usual 6-in. hole, which is most commonly used. To drill an 8-in. hole with the same relative speed as the 6-in. hole, of course, requires the use of a heavier stem and bit and a more powerful machine to handle the drill steel. The advocates of this size of hole claim that the cost of drilling is very little more, that the wider spacing possible makes it more economical all around.

I find that it costs from 25 to 30% more to drill an 8-in. hole than to drill a 6-in. hole. It is true, of course, that wider spacing should be possible with the larger hole. About 77% more explosive of the same kind can be loaded in an 8-in. hole than in a 6-in. hole. Hence, in the same proportion one ought to get 77% greater volume of rock with the 8-in. hole in order to keep the same explosive cost per ton. The trouble is, however, that drillers space these holes altogether too far apart and back, and in many cases very poor results are obtained. I have seen 8-in. holes spaced 35 ft. apart and 50 ft. back in hard trap rock. The driller went on the false theory that he could increase the spacing both apart and back as the square of the diameter increases; that is, as 36:64. This, of course, is four times the volume of rock. There is no reason to expect any more or better execution from an explosive loaded in an 8-in. hole than in one of any other size. It can do so much work and no more. It is a mathematical fact that the spacing between and back can be increased only in direct proportion to the diameter; that is, as 6 is to 8. In other words, the spacing each way could be increased one-third more with an 8-in. hole than a 6-in. hole. This will give exactly the proper increase of tonnage at the same explosive cost per ton as produced with a 6-in. hole. Unfortunately we cannot always follow theory. In limestone formations there are often present many seams, faults and caves which have a great effect upon the execution of the explosives. The material is not homogeneous. My experience has shown that it is impossible to maintain this theoretical increase and get as good fragmentation with the 8-in. hole as with the 6-in. hole, especially in limestones. The aim is to secure as great fragmentation as possible in the primary blasting and this certainly cannot be brought about by increased spacing, but rather by closer spacing. I believe it unwise to space holes too far apart and this seems to be the great tendency. I am inclined to think that 20 ft. apart should be the maximum in most limestones.

In limestone well drilling is comparatively easy and cheap and may vary from 35 cents to $1 per foot for a 6-in. hole. Closer spacing is an advantage and a 6-in. hole is amply large enough in the vast majority of quarries and more economical and efficient in the long run. On the other hand, drilling in trap, quartzite and other hard diabase rocks is very slow and expensive and may vary from $3 to $6 or more per foot. In a case like this I believe the larger 8-in. hole is an advantage. Trap rock usually breaks up better than limestone, but the drilling is much harder and more costly. And even if the theoretical increase in drill spacings is not always possible, the use of 8-in. holes in this type of rock is likely to be more



Working face of a quarry in which the bench method is used to break down the stone

economical, all things being considered.

The well-drill method of operation is now the most widely used in quarries and probably will continue to be, especially in those of the side-hill type, the usual kind found in the eastern and western parts of the country.

There are many cases, however, especially in pit quarries, where this method of drilling and blasting is not as well suited as the so-called shallow bench system with high-speed hammer-type drills.

Effect of Development of Caterpillar Tread Equipment

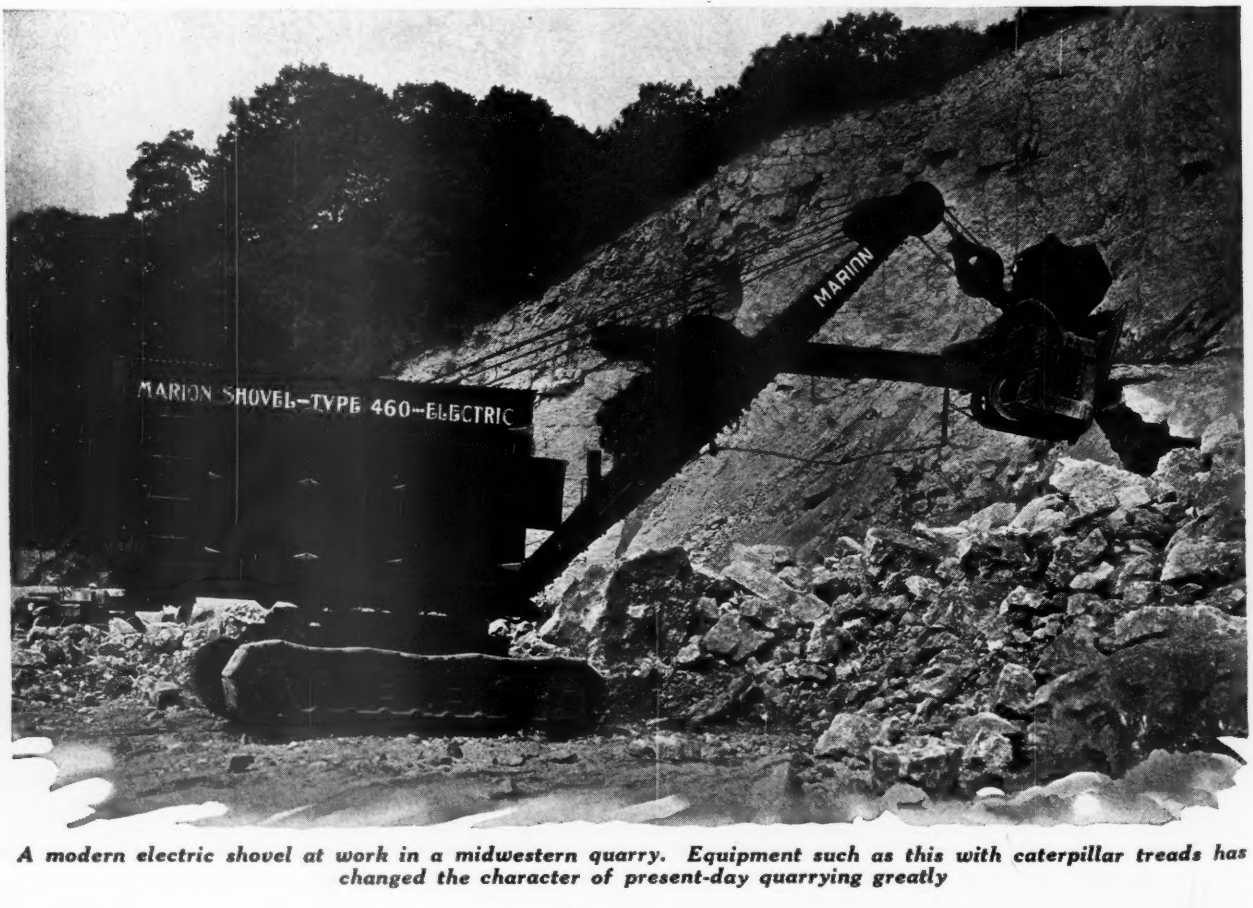
The European war developed the tank equipped with caterpillars and from this idea came the mounting of power shovels on crawlers or caterpillars. This has been one of the greatest advances made in excavating machinery in recent times and has made possible optional methods of operation in quarries. Some power shovels are equipped with large wheels. In either case, the object is to obtain easy and flexible movement of the shovels from place to place. The crawlers eliminate entirely the use of rail sections and also dispense with two or three men formerly necessary with old-type shovels. With the old-type shovels the question of time consumed in moving was quite a factor in the output. This was especially so where a low face of stone was quarried, and because of this quarrymen naturally tried to get as high a face as possible. If they were compelled to use a low face because of natural limitations, they tried not to shoot the stone out well, because with a thin cut more moves were necessary for both shovels and tracks. This type shovel had considerable bearing also on the question of multiple-row firing and buffer shooting previously mentioned. It had a great deal to do with the tendency to carry high quarry faces and, of course, the well drill was the only machine that could put down holes to suit. With the shovel on crawlers, however, no time at all is lost in moving. The shovel always has its nose in the bank. Consequently, it is more flexible and can dig as much in a low face as in a high one. In fact, the lower face in many ways is an advantage, because stone can be shot out farther and prepared better ahead so that a full dipper—or more nearly so—can be lifted at each swing.

For a long time it looked as though the well drill would dominate the field because other manufacturers seemed to lag in furnishing a drill of the tripod type suitable for even moderately high faces. During recent years, however, several manufacturers have put on the market a type of drill which is a self-rotating hammer drill on the same principle as the jackhammer, but heavier and stronger. These drills use 1¼-in. hollow steel and can be mounted on wagons or derricks as well as on tripods.

In some quarries the steel is changed every 8 ft. and in others every 12 ft. Holes are drilled dry, but a water jet can be used to advantage in some materials. These drills are far ahead of the old-type piston machines. They operate at very high speed, and I know of many limestone quarries where 40 ft. per hour is made. With them it is possible to drill a 30- to 32-ft. hole, finishing 2 in. in diameter or better. Now in quarries where the body of stone is less than 30 ft. I believe it is much more economical and efficient to use this type of machine than a well drill. It is necessary, of course, to drill more holes at closer spacing than with a well drill, but these holes can be loaded higher with explosives, several rows can be shot at one time, better distribution of the explosives is gained and much better fragmentation results. This means materially better primary shooting, less secondary shooting, greater shovel output and all-round lower cost of operation and production.

Let me cite two actual conditions in quarries working exactly the same stone in the same neighborhood.

The vein of limestone is from 20 to 22 ft. thick. In one quarry a well drill is used, putting down 5-in. holes spaced 8x8 ft., which means 5⅓ tons of stone per drill foot. The drill averages 75 ft. per day of 10 hours, or produces 400 tons of stone per day. In the other quarry these high-speed drills are used and average 30 ft. per hour or 300 ft. per 10-hour day. Holes are spaced 5x5 ft. and at times 6x6 ft. The average tonnage is 2½ tons per drill foot. Each drill therefore produces 750 tons of stone per day. The primary explosives cost in both cases is about the same, if anything, favorable to small drills. The initial fragmentation, however, with the high-speed drills is much better, secondary shooting costs much less and shovel efficiency is proportionately greater.



A modern electric shovel at work in a midwestern quarry. Equipment such as this with caterpillar treads has changed the character of present-day quarrying greatly

If I had to open a quarry in a flat country—it would of course be of the pit type—I would favor carrying the face from 25 to 28 ft. high, so that 30-ft. holes could be drilled with high-speed hammer drills. These with full revolving electric shovels—not too large—mounted on crawlers would, I think, be ideal equipment for a quarry operation. I know of some instances where this type of drill has displaced the well drill and much better results followed. I am told that larger steel than 1¼-in. hollow may be available at no distant date, so that possibly holes up to 40 ft. or more can be drilled with this type of equipment.

In shallow well-drill holes it is impossible to get proper distribution of the explosive in the rock and still keep the cost of blasting within reason. A heavy spacing or tonnage per foot cannot be had, hence as a rule the explosive is confined only at bottom. With smaller 2-in. holes, and more of them, this same explosive ratio can be used, but the charge is allowed to rise in the holes, so that much better distribution is gained, with consequently better results.

In some limestone quarries where the stratification is irregular or pitching heavily, and where it is almost impossible to maintain regular benches—as in trap and other igneous rocks where drilling costs are naturally high — the so-called snakehole method of blasting is often employed. This consists in drilling holes with tripod drills along the bottom of a face of rock, springing them heavily to make chambers according to the overburden, so they can be loaded with from 150 to 500 lb. or more of dynamite.

One Row of Snakeholes Enough

Holes up to 30 ft. in depth are common and a face of rock from 50 to 80 ft., especially in traps, can be worked successfully with one row of snakeholes. Gelatin dynamite is recommended for springing shots, especially in the hard trap rocks. The chamber or pocket can be loaded with either gelatin or ammonia-type dynamite. This is a very efficient and economical method of blasting where it is suited. Of course, in order to use it exclusively the face must be long enough so that part of it can be drilled while stone is being removed from the other, because it is necessary to clean up the stone before the drills can be set up and holes started for a new blast.

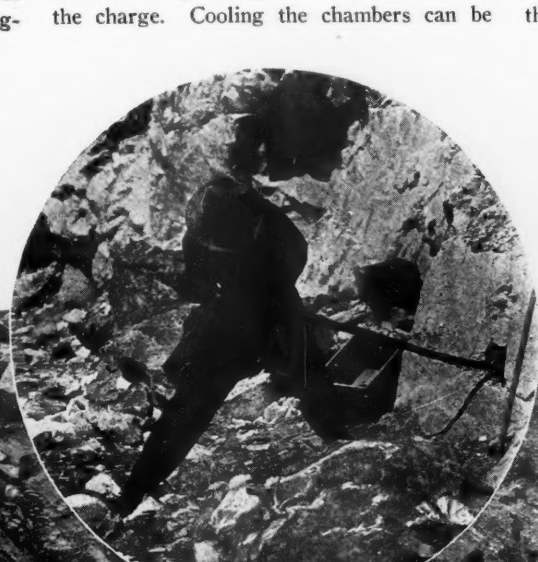
Snakeholing, as a regular method or system, is probably misnamed. It is not used so much as formerly, but the practice is sometimes necessary in any quarry to remove a heavy toe, or to help pull bottom where well drills are used. And the same principle and rules apply.

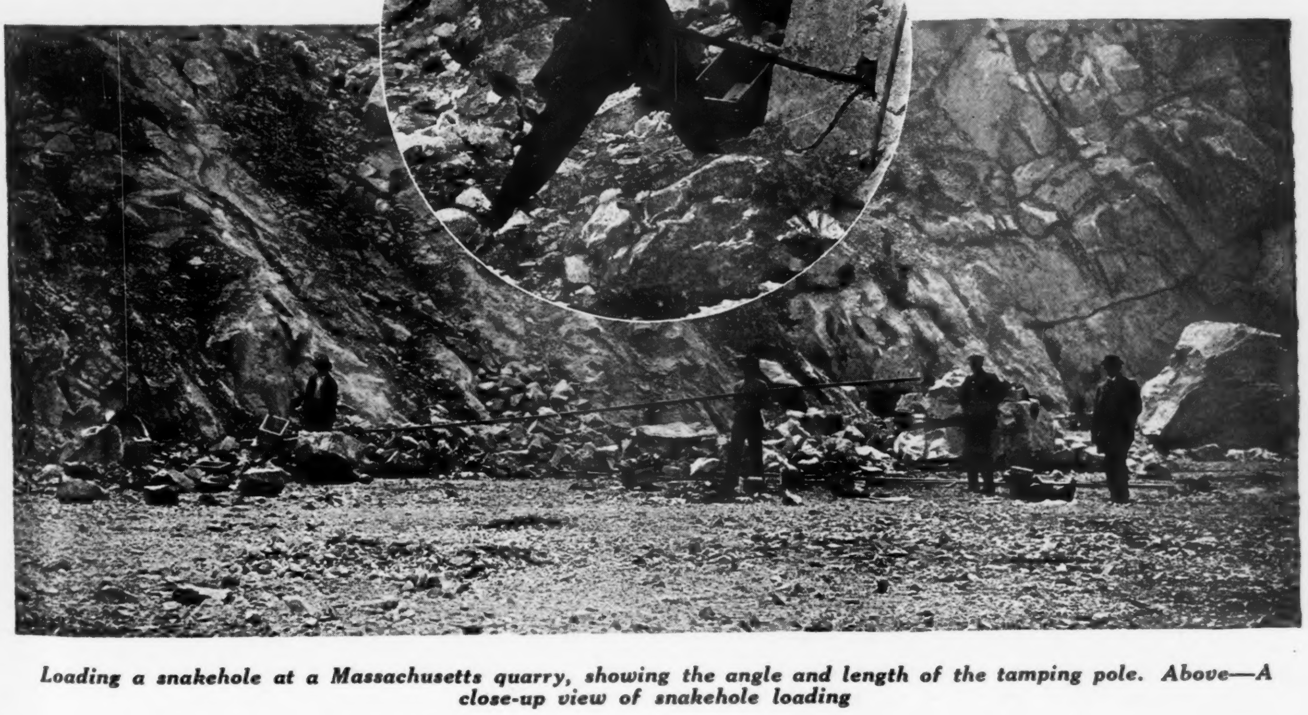
The holes should be started 3 or 4 ft. above the quarry floor level and allowed to dip so that at the point they are at or just above the level of the floor. This is important, for if a hole is started too low the point may be several feet below the quarry floor, and, after springing, still lower. Care should be taken to allow sufficient time for the holes to cool after each springing charge is exploded and before another is loaded. From one-half hour up to six or more hours should intervene, the time depending on the number of springing shots and the size of the charge. Cooling the chambers can be hastened by blowing in compressed air or water. The temperature can be tested by a thermometer tied on a stick or by feeling with the hand the tamping pole after it has remained in the hole several minutes. After the first springing shot tamping should be used on the following charges to prevent excessive raveling of the hole. About 12 to 18 in. of stemming is usually sufficient.

Blasting by the Coyote Method

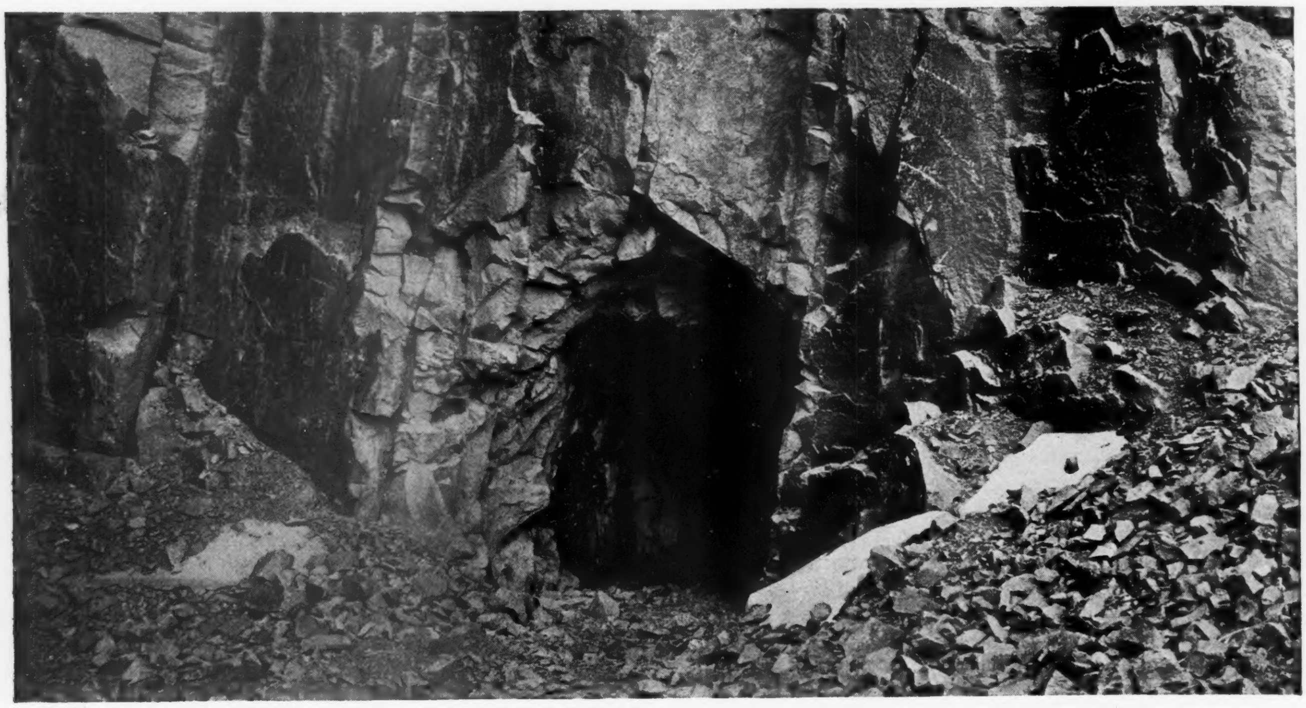
The coyote or tunnel method of blasting has been coming into favor recently in the east, especially in trap rock quarries. This method consists in driving a small drift or tunnel at the bottom of and at right angles to a face of rock, with cross headings at intervals to the right and left. These tunnels are usually about 3½x4 ft. in section. It is an old method and is employed also to some extent in the West Coast states. We think it is particularly suited to the trap rocks of New England and eastern Pennsylvania. The rock here is hard and costly to drill, but it breaks well, especially where the columnar formation is found. Well drilling, on the other hand, is costly, varying from $3 to $7 per ft. In the high faces snakeholing is also impracticable, although it is used in lower faces with success. Of course, snakeholing and tunneling are similar except that the latter is a larger scale operation.

The cost of driving tunnels in these rocks averages around $6 per ft., but in a high face the tunnel method is much more to be depended upon than well-drill holes to pull the bottoms. The well drill makes rather slow progress in these hard rocks and the wear on the bits is great, requiring frequent changes. For faces under 70 ft., the tunnel method is probably not economical. One system of tunnels can be depended upon to pull nicely a face of





Loading a snakehole at a Massachusetts quarry, showing the angle and length of the tamping pole. Above—A close-up view of snakehole loading



The entrance to a coyote tunnel in the face of a trap rock quarry in New York State

rock from 125 to 150 ft. in height without leaving a bank too high at the back. When the face exceeds this height it is well to use a combination of well drills and tunnels, placing the holes part way the height of the face and directly over or just behind the tunnels.

Procedure Followed

Tunnels are usually driven in the form of a "T" and may have one or more legs or cross-headings, depending on the overburden. Where a double "T" or more than one cross-heading is used, the back wings should be loaded heavier than the front. For faces from 90 to 125 ft. in height with a single "T" tunnel, a 40- to 50-ft. horizontal burden can be taken. The wings, of course, can be as long as desirable, but 75 to 80 ft. is about the limit for each wing because of convenience and economy in mucking and loading. Some people prefer placing explosive charges at intervals along the wings in sumps or pits driven below the grade, but we have had excellent results when they have been placed at floor grade. We think it advisable to load heavily in tunnel blasting so that the stone is well thrown out to avoid high banks on the last cuts of the shovel. We have loaded usually in the proportion of five tons to the pound of 40% dynamite, neat line measurements, but hereafter in some of these tunnels we expect to load on a four-to-one ratio.

In a columnar formation with a high face, the bottom comes out well but the upper part of the face drops down vertically and wedges itself very tightly so that it seems to be almost as solid as in its original condition. This is especially noted when the face of the rock is 150 ft. or more; hence, we advise a combination of well drills and tunnels in such cases to avoid this condition. The tunnel method is more applicable to hard rocks than to limestone formations. Limestone breaks bigger and may have many faults and caves; besides it drills easier. Therefore, we recommend well drills in limestone rather than the tunnel method, except in emergency.

Tunneling Recommended for Trap Rock

There is no question in my mind that tunneling is more economical than well drilling in trap rock. Let me cite an actual case to show the great economy possible. In a quarry in which we made a tunnel blast this year the face averaged 110 ft. high. Six-inch holes were used, spacing 15 ft. apart and 25 ft. back, or 34 tons of stone per drill foot. The cost of drilling was $4.50 per foot, or about 13 cents per ton. Sixty per cent dynamite was used in the holes with good results. We drove a tunnel in this quarry, the adit or stem being 50 ft. long with 50-ft. wings. The cost of driving was $6 per foot, or about 2 cents per ton. We used 40% dynamite instead of 60% as in the well-drill holes. The stone was just as well broken with tunnels and we had greater volume of material.

To sum up, it would have required 12 holes, 115 ft. deep (5-ft. subdrilling), or a total of 1380 ft. at $4.50 per foot—a total cost for drilling of $6210—to produce 50,000 tons with well-drill holes. These holes would require 12,000 lb. of 60% dynamite, costing $1920, or a grand total of $8130 for drilling and blasting. The actual cost under the tunnel method was: drilling, $900; 40% dynamite, $1560; total, $2460—a saving of $5670, or over 11 cents per ton.

In loading tunnels the explosive units may vary from a few hundred to several thousand pounds each. It is best, I think, to use dynamite in large-sized cartridges and to remove them from the boxes. They can be stacked or piled up like cordwood at intervals of 15 or 20 ft. along the wings of the tunnels, no explosives being placed in the adits.

Intermediate Stemming Not Necessary

The usual method in this kind of blasting is to stem the spaces between the explosive units with sand, fine stone or muck taken from the tunnels. Of course, the adit is filled with stemming for at least 75% of its length. The labor involved in placing this stemming in the wings is hard, slow and tedious; in fact, it is the most disagreeable part of the work. We have thought for some time that this intermediate stemming could be dispensed with but never had a chance nor the courage to try it until the past summer. We arrived at the idea in this way: Assuming a tunnel system with a 50-ft. adit and 50-ft. wings, with an average section 4x4 ft., the total volume of air in the wings is 100x4x4 ft. or 1600 cu. ft. Assuming a charge of 12,000 lb. of "Red Cross Extra" necessary to pull the burden, this amount of dynamite will produce about 100,000 cu. ft. of explosive gases at a very high temperature and pressure. Now this much "Red Cross Extra" in 5x16-in. cartridges would occupy in itself 180 cu. ft.

In loading tunnels the space across the intersection between the last charges placed in each wing is stemmed and from there out toward the portal. This distance is about 15 ft. long, or 240 cu. ft., making 240 plus 180 cu. ft.. An excess of explosive gases to

counterbalance this volume would only require about 125 lb. of "Red Cross Extra," a negligible amount when one considers the time, effort and expense of placing this stemming. In fact, the difference is even less than that, because with rock stemming the voids are probably as much as 30%. Results from about six tunnels shot in this way with no stemming between units in the wings were very satisfactory and led us to believe that stemming between explosive units in tunnels of normal section can be omitted with equally good results.

At one time we favored powders of the Judson type for tunnel blasting, but we have come to believe that dynamites give much better results in the hard rocks with which we are familiar. Usually no higher than 40% ammonia dynamite is necessary, but I know of a few cases where 60% has been used with better results.

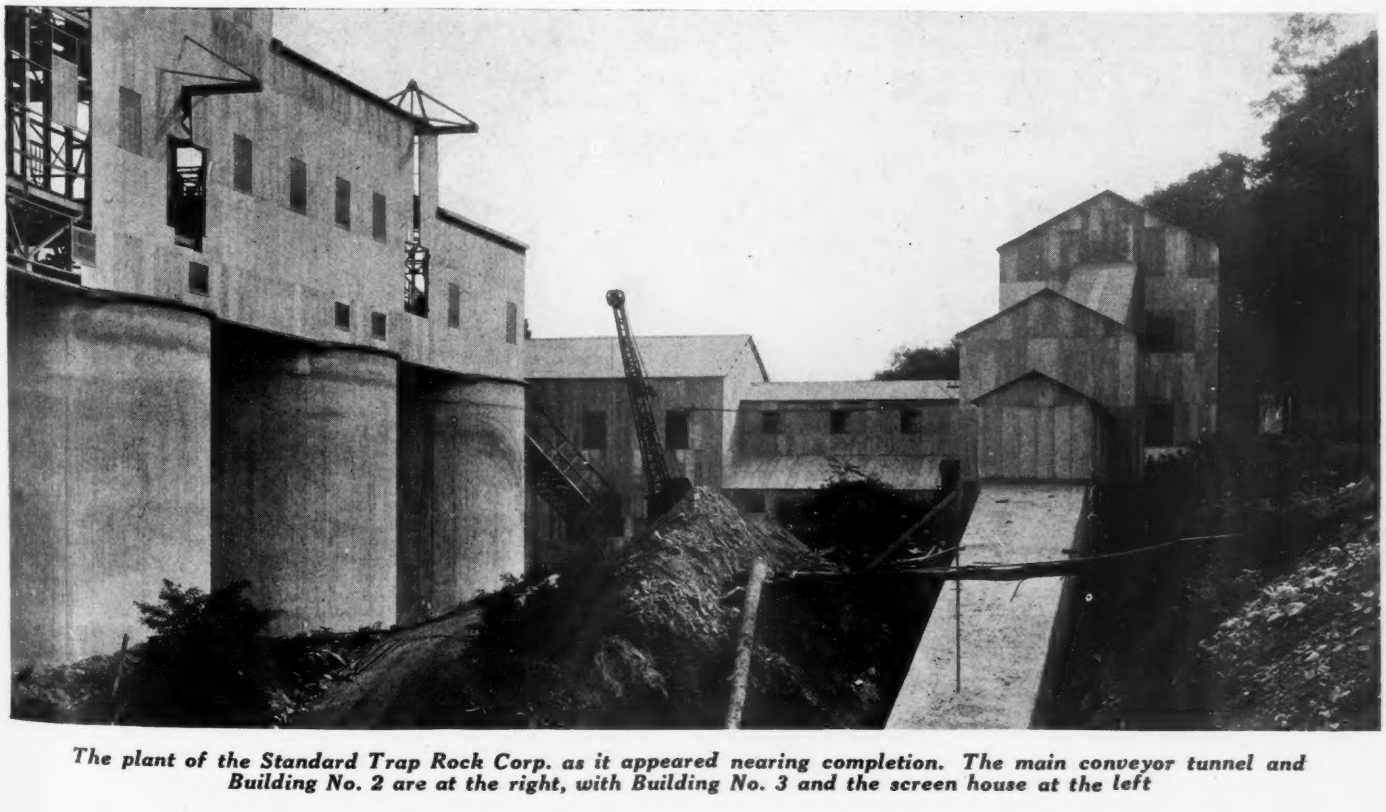
As a rule, in hard rock I think it better to use high-strength exploisves, no matter what method of blasting is employed. More trouble and complaints arise from poor or unsatisfactory breakage than from any other thing. It is most importent to get maximum fragmentation in the primary blasting in most quarries so that secondary treatment is reduced to a minimum. The blasting affects every subsequent operation such as loading, hauling, crushing and the like. If stone is not properly broken, the result is felt all along the line and the cost of production is increased proportionately throughout the entire plant and process.

A Million Dollar Crushed Stone Plant Which Will Never Operate

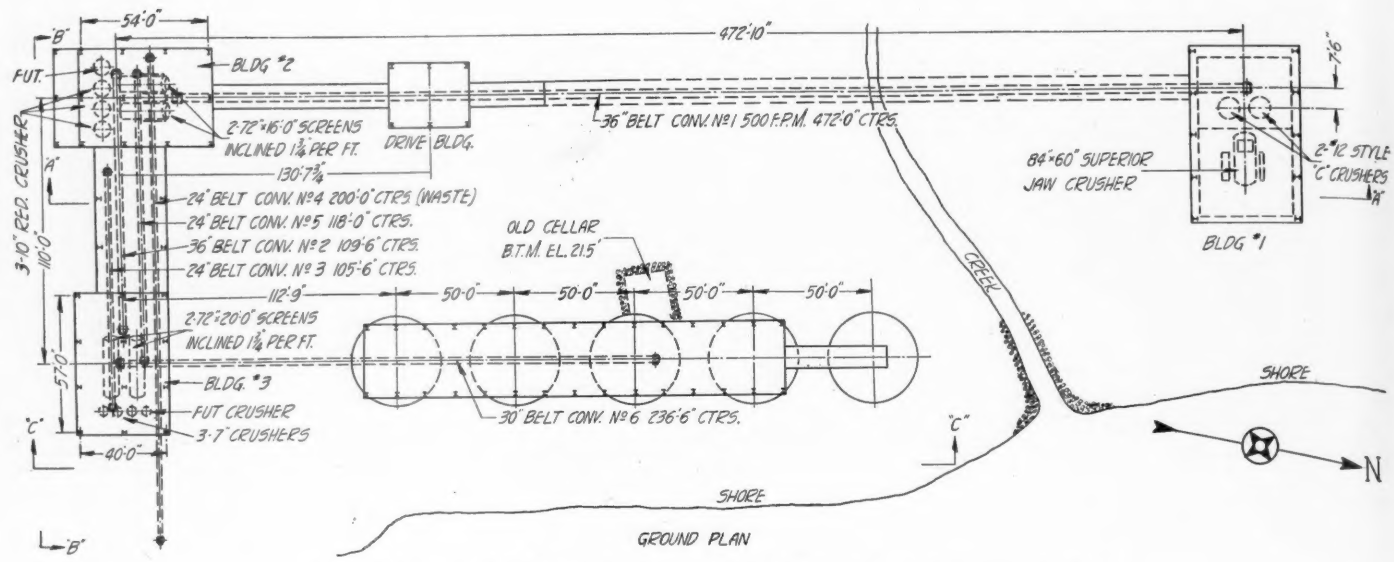
Standard Trap Rock Corp., of New York City, Completes Outstanding Plant Only to Have Palisades Park Commission Prevent Its Operation

WHEN a new industrial plant is about to be placed in operation, the owners, engineers, builders, and all other interested parties are anxious to get the last things done so that the plant will have the opportunity to show whether it will live up to expectations under actual operating conditions, or whether, after all the expenditure, it will fall below expectations. But the newest plant in our rock products field, and perhaps the most advanced in design of any new aggregate plant, will never be able to answer this question, for here is a plant with an estimated cost of $1,000,000 which will never operate. This plant is that of the Standard Trap Rock Corp. of New York City, which is practically completed at Piermont, N. Y. It is located hardly more than ten miles from the city of New York, up the Hudson on the west bank. Located as it is so near the heart of this great metropolitan area, there could be no question that it would be a paying proposition, since the stone is a good grade of trap rock, entirely suitable for construction work in the territory. But almost as the last bolt was tightened, the Palisades Interstate Park Commission swooped down on the plant, decided that it was defacement of the picturesque banks of the Hudson, and so must never operate. Thus the taxpayers of the district are the owners of a quarry operation having a guaranteed capacity of 5000 tons per day, which, as far as they are concerned, is junk.

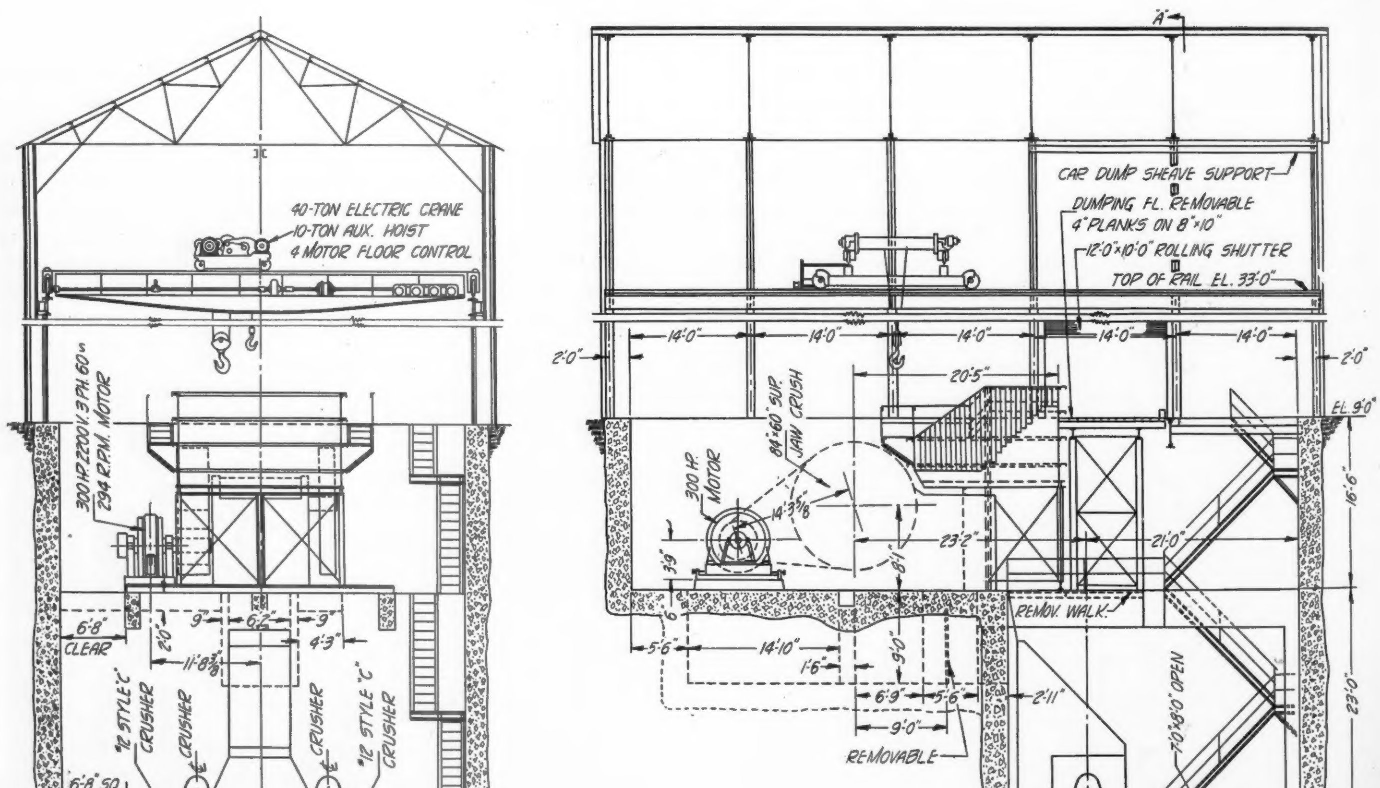
The property includes over a hundred acres of rugged river front land and the plant itself. The latter, of course, will be of no use to the commission and will have to be dismantled and torn down. If the condemnation proceedings had not been started, the plant would be in full operation today. The whole operation, by the way, would have



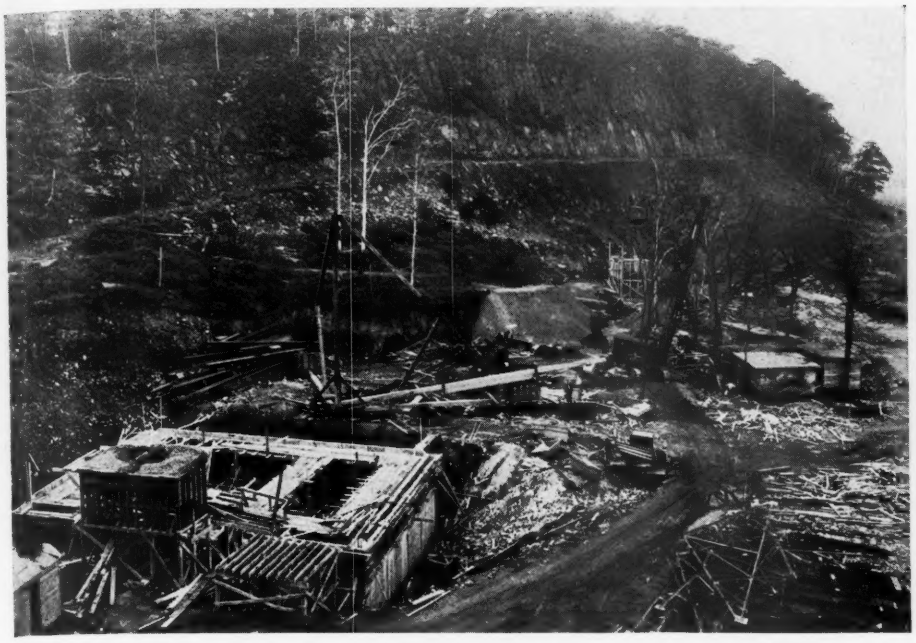
The plant of the Standard Trap Rock Corp. as it appeared nearing completion. The main conveyor tunnel and Building No. 2 are at the right, with Building No. 3 and the screen house at the left



General layout of the Standard Trap Rock Corp. plant at Piermont, N. Y.



Section and elevation of Building No. 1, containing the primary crushers



The plant under construction. The substructure for Building No. 1 shows to the left and the quarry site is in the rear

employed about 75 men from the stripping in the quarry to the loading of the finished stone on the boats at the river front.

Despite its untimely end, the Standard plant may well be taken as a model for crushed stone plants of the future. The company declared at the outset that they were going to build the "last word" in stone plants and this intention was carried on to completion. James G. Shaw, vice-president of the Standard Trap Rock Corp. has had many years of experience in the rock products field and the plant was designed following his directions and suggestions. The Burrell Engineering and Construction Co., of Chicago, which has built some of the largest plants in the industry, did the general designing for the Piermont plant, and also did the erecting of the plant as well. The plant is notably of the most fireproof construction possible, being constructed throughout with reinforced concrete foundations, and a structural steel superstructure enclosed with corrugated iron sheathing. Fitted steel chutes are used throughout, and generally where there is a removable section of floor, the piece is of ¼-in. steel plate instead of planking.

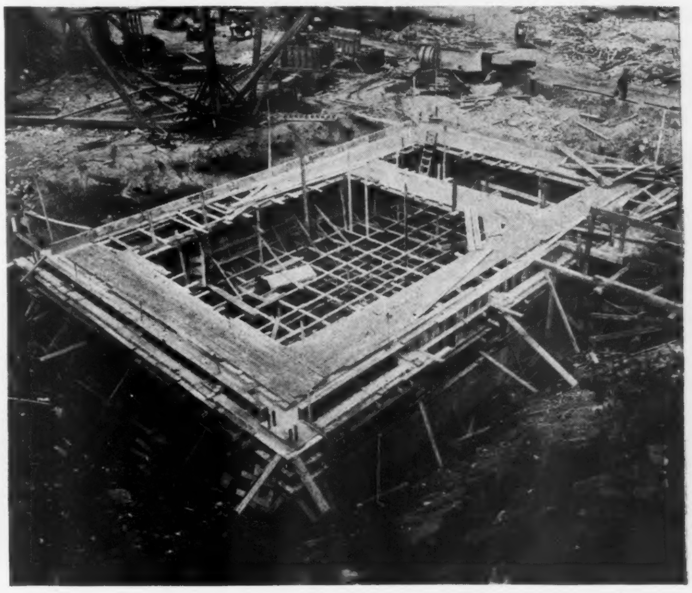
Safety features have been built right into the Standard plant, since every floor opening, raised platform, or other dangerous condition about the mill is guarded with a stout iron hand-rail whose supports are firmly fastened to the concrete or structural steel floor. One other feature of the design is at once noticeable. This is that bucket elevators of all types have been done away with, and all of the conveying is done on belts. The maximum incline of any belt is 20 deg. from the horizontal.

At this point on the west shore of the Hudson there is a wide swampy strip from which the high ground rises abruptly to the hills which flank the river. The plant is located just at the beginning of the high ground, with the bluffs towering high above it for the most part. The quarry was to be in these hard trap rock bluffs well above the plant. The top of the bluff is fairly thickly wooded, but even so, stripping would not have been a serious problem as the overburden does not reach to any considerable thickness. The quarry was to be operated by trucks and it was proposed to use two 3-yd. Marion revolving electric shovels to load them. From six to ten 6-yd. trucks were to be used, and the estimated haul for the first few years would have been from 200 to 800 yd.

To visualize the operation of the Standard plant one must understand that it consists of four main buildings, roughly placed in the shape of a "U." The stone passes in order through the primary crusher building, the scalping screen building, the building containing the secondary scalpers, and finally through the sizing building over the bins.

The quarry trucks bring the rock to the primary crushing house which is designated as Building No. 1. Since the driveway for the trucks is at approximately the normal ground level it can be seen that most of this building must be below the ground surface as all of the crushers are below the truck driveway. The greater portion of the building is a pit reaching to a depth of 70 ft. below the earth surface. This pit, however, was sunk in the solid rock and is thoroughly waterproofed, so that no seepage of any consequence was noted after its completion, even though the bottom was well below the high water mark of the river opposite that point. The part of the building which is above ground is of structural steel with corrugated iron sheathing furnished by the American Sheet and Tin Plate Co. of Pitts-

The quarry site



The pit for the primary crushers

burgh, which supplied all of the sheathing for the buildings at this plant.

The trucks enter Building No. 1 over a driveway of 4-in. planking and dump directly to the primary crusher. The planks of the roadway are removable to permit easy replacement, and also to facilitate work in the pit below if it should be necessary to make replacements or install additional equipment. The primary crusher is an 84x60-in. Allis-Chalmers jaw crusher placed just below the level of the driveway. Around the top of this crusher is an elevated steel platform from which the crusher men can watch the rock as it is fed to the crusher and take care of any big recalcitrant pieces that "just won't be crushed." Upright steel railroad rails at the side of the hopper away from the roadway prevent the large pieces from crushing the platform and keep the rock in the feeder hopper above the jaws. The 300-hp. motor on the primary crusher was furnished by the Allis-Chalmers Manufacturing Co., as were all the other motors in the Standard plant. The crusher is operated through a Texrope drive.

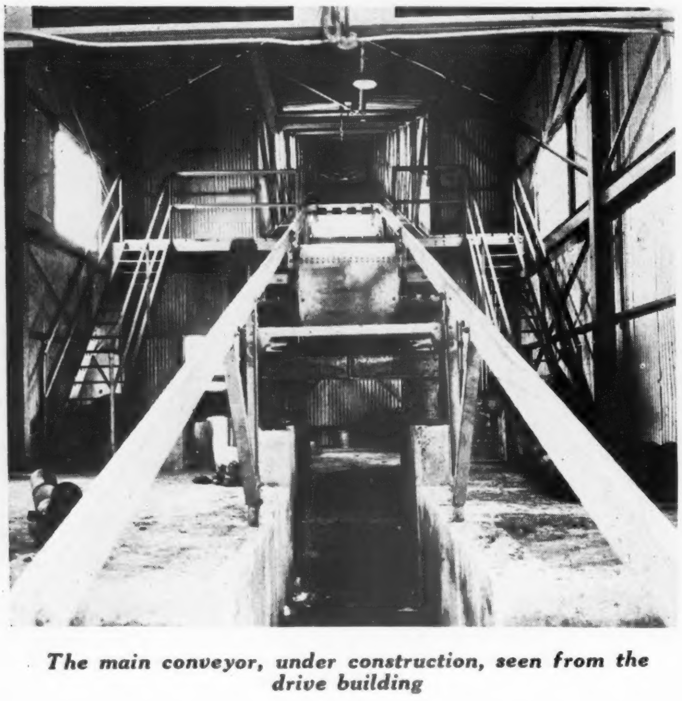
The scalping screen building with the drive building and main conveyor at the left

The discharge from the jaw crusher is chuted to the floor below where it is evenly divided between two No. 12, Allis-Chalmers "Style C," gyratory crushers. Each of these is driven by its own 200-hp. motor. The stone from these two gyratories is brought together again and deposited on the foot of the long main conveyor which is to take it to the next building.

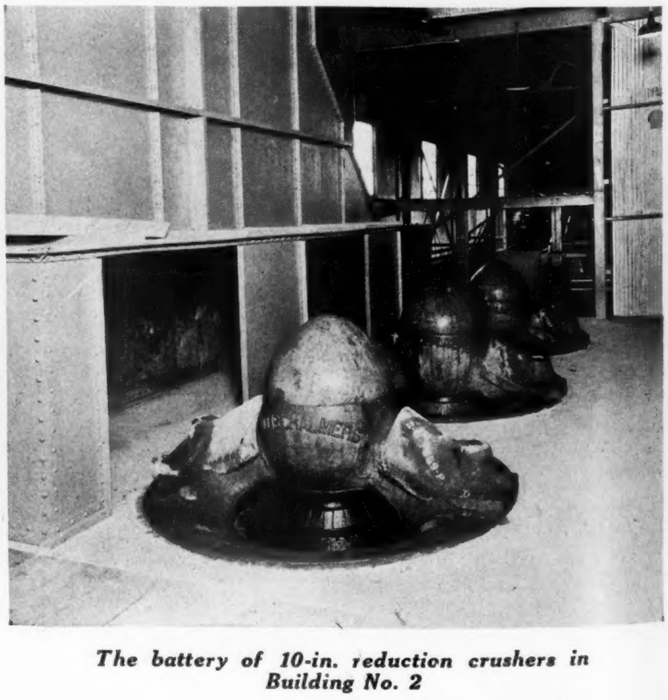
The main conveyor, designated as No. 1, is a 36-in. belt running in a tunnel from the bottom of the pit under the primary crusher house up to the drive building at the ground level, and from that point continuing on a truss to the top of the scalping screens building, which is known as Building No. 2. The total length of the conveyor, from center to center is 471 ft. $6\frac{13}{16}$ in., with a 4-ft. takeup at the lower end. The slope is slightly more than 18 deg. from the horizontal. The conveyor itself was furnished by the Robins Conveying Belt Co., of New York, which supplied all of the conveying equipment in the plant. After leaving Building No. 1, approximately 170 ft. of the tunnel for the main conveyor is cut through solid rock so that no concrete walls nor ceiling were necessary, although a concrete slab was laid on the bottom of the tunnel to which the conveyor supports are attached. For the balance of the distance to the drive building the conveyor is enclosed in a concrete tunnel which is covered only thinly with the earth above. The section of the tunnel is the same throughout its entire length, however, being 10 ft. across and 6½ ft. high. At one point the tunnel passes under a small stream which comes down from the bluffs back of the plant.

Main Conveyor Drive

The drive building is a one-story structure of concrete, steel and iron sheathing. In it is installed a 150-hp. motor which operates two 24-in. tandem drive pulleys through a Texrope drive. The under or return side of the conveyor belt passes around the far pulley, up between the two pulleys, down around the near pulley, and on out of the drive building. With this arrangement, each pulley has more than half of its circumferential area in contact with the belt, or, in other words, the drive is on more than a complete circumference of a circle, so that there is little



The main conveyor, under construction, seen from the drive building

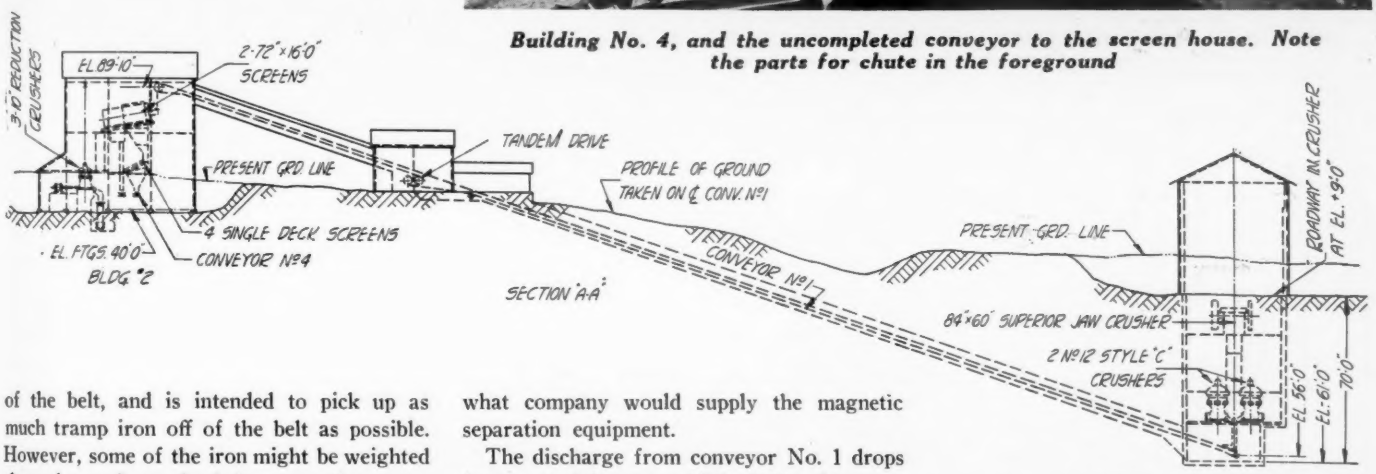


The battery of 10-in. reduction crushers in Building No. 2

possibility of any slippage or faulty driving. The conveyor is carried on an enclosed truss from the drive building up to the top floor of Building No. 2. This makes a total raise from the pit below the crushers to the hopper above the screens of 146 ft. for this one belt.

It is apparent in the design of this plant that every last detail has been checked and every known improvement has been included. Most crushing plants seem to be able to worry along without the added expense of the installation of magnetic separation equipment to prevent tramp iron from getting into the screens and crushing machinery, and other plants apparently do very well with only one magnet or magnetic pulley, but the Standard company was to have had two magnetic units in operation. These are both at the head of the main conveyor and each is a magnetic plate suspended from its own 2-ton beam attached to the roof trusses. The first unit is hung parallel to the plane

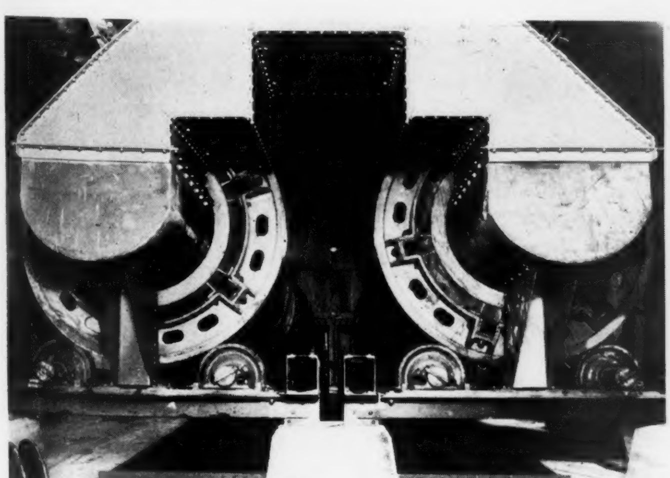
Building No. 4, and the uncompleted conveyor to the screen house. Note the parts for chute in the foreground



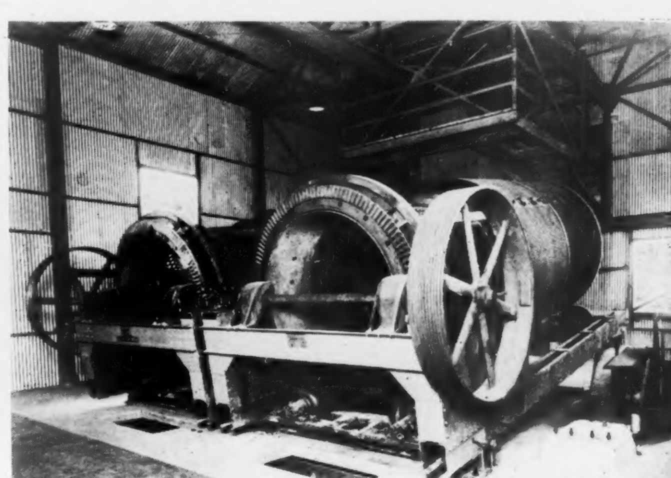
Layout of Conveyor No. 1

of the belt, and is intended to pick up as much tramp iron off of the belt as possible. However, some of the iron might be weighted down by rock on the belt, so another magnet is hung just beyond the end of the belt to collect the remaining metal. As the discharge passes off the head of the belt, all of the pieces are free in the air for an instant as they pass under the magnet, and the separation of the metallic pieces is readily completed at this point. It had not been decided what company would supply the magnetic separation equipment.

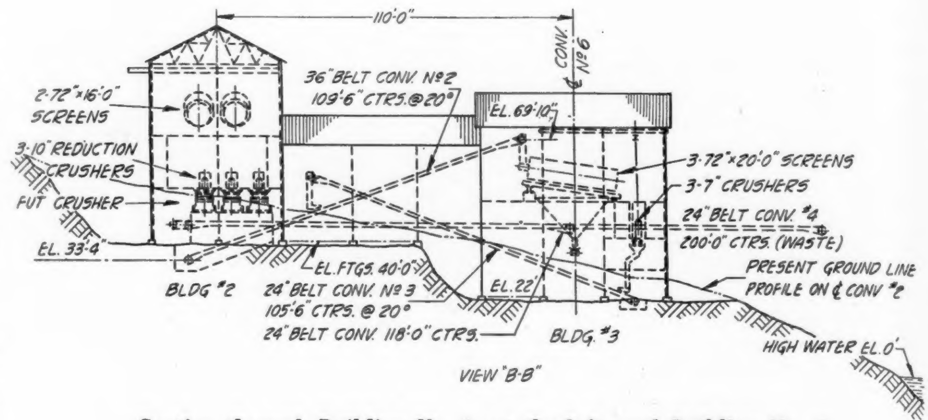
The discharge from conveyor No. 1 drops into a steel hopper which divides into two chutes, each of which leads to one of the pair of scalping screens below. An unusual feature of the arrangement is that the openings to the chutes are not in the bottom of the hopper, but are in its side walls instead. Also each chute is built with one large horizontal step, instead of being a straight incline. The reason for this design is obvious when one realizes that a pile of stone will immediately build up in these horizontal "dead spaces," and thereafter the wear from the very abrasive stone falling into the hopper and through the chute will all be on the



Pair of scalping screens showing the arrangement of the stepped chutes



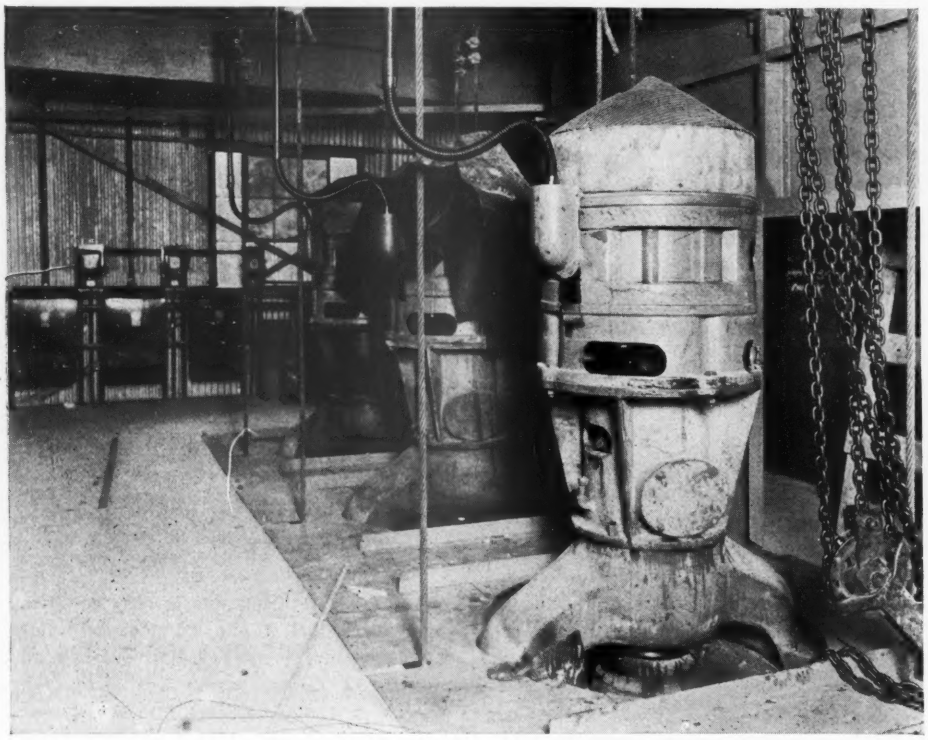
The two jacketed scalpers in the scalping screen building



Section through Building No. 2, at the left, and Building No. 3

contained rock, and none on the metal walls.

The pair of scalpers are 72-in. by 16-ft. Allis-Chalmers revolving screens with 11½-ft. jackets. The main sections have 2½-in. round holes and the jackets have ¾-in. round holes. Each screen is driven by its own 25-hp. electric motor through a Texrope drive. The stone passing through the holes in the two jackets drop through steel chutes leading to a battery of 48x102-in. Robins "Gyrex" vibrating screens on the floor below. The chute from each scalper divides into two chutes, each of which leads to one vibrating screen, there being four screens in all. Each screen is driven by a 5-hp. motor through a Texrope drive. These chutes, as the ones above the scalpers, are built in steps to prevent wear on the steel. The fine material passing through the vibrating screens is not of commercial value and is carried away to a waste pile by conveyor No. 4, which passes across under the battery of screens. The rejects from the screens fall to conveyor No. 5, which is located across the foot of the screens. Both of these conveyors are 24-in.



Battery of three new style crushers, each equipped with its own vertical motor

The material from the two scalping screens which passes through the 2½-in. holes in the main sections, but does not pass through the holes in the jackets, falls to the chute under its particular screen. These two chutes then unite on the floor below, by means of steps instead of slopes, and together deliver their material to conveyor No. 5, which, as noted above, also receives the rejects from the "Gyrex" screens.

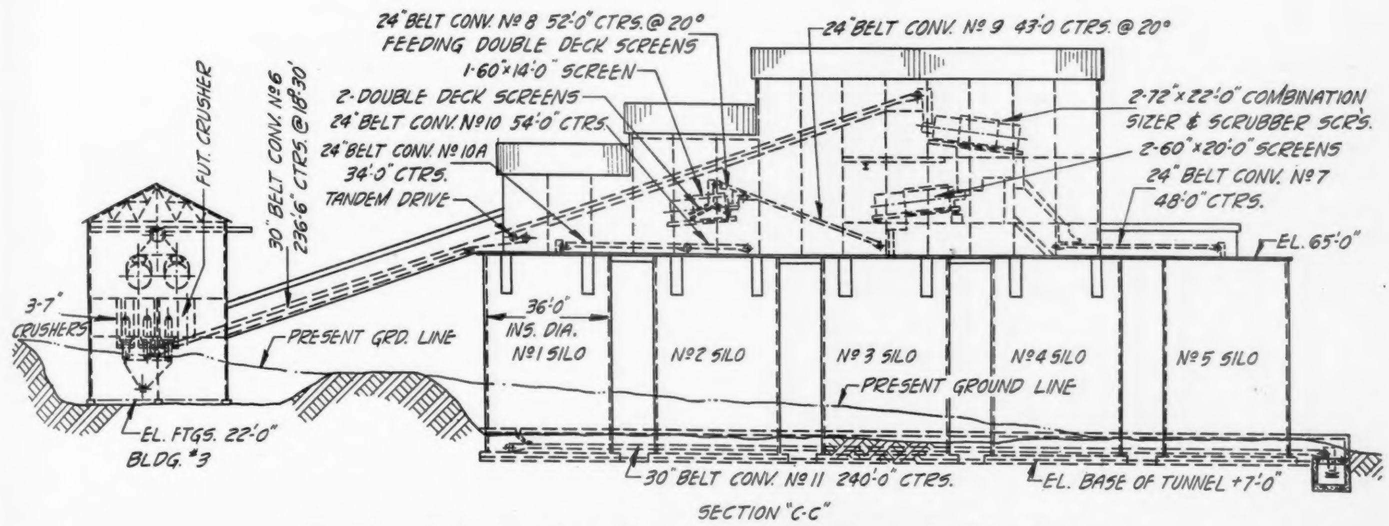
The rejects from the two scalpers drop to three McCully 10-in. reduction crushers, with one step interposed in the drop to prevent excessive wear. Provision was made for the future addition of a fourth crusher to this battery if it was found necessary, but now this will never be done. The installation of a fourth crusher would have made this building entirely symmetrical, as otherwise the stone is exactly evenly divided to screens, vibrators and crushers. Each of the three crushers is direct-connected to its own 100-hp. motor through a flexible coupling. The design calls for a motor speed of 490 r.p.m. The discharge from the three crushers falls to a 36-in. belt conveyor designated as No. 2.

As an example of how complete the design of this plant is, it is noted that in the roof of Building No. 2 there is an 8-ton trolley beam directly above the line of the three crushers. These crushers are at the end of the building, beyond the ends of the two scalping screens, so that access to the crushers by means of a hoist suspended from the overhead beam is easily accomplished when the removable steel plates in the screen floor are taken up. More than this, there are two similar trolley beams of 5-ton capacity over the scalpers, one being directly over the centerline of each screen, for use in installing, repairing and replacing these units.

After the scalping screen building comes the connecting portion between Buildings 2 and 3. This contains the two conveyors from the battery of vibrating screens Nos. 4 and 5, which run in a horizontal plane, and conveyor No. 2, from the three 10-in. crushers, which is inclined upward at approximately 19 deg., so that enters Building No. 3 at the upper floor. The latter conveyor is driven at its head end by a 40-hp. motor through a Texrope drive.

Conveyor No. 2 delivers the crusher discharge to a pair of Allis-Chalmers 72-in. by 20-ft. revolving screens without jackets. These screens have 2¼-in. round punched holes. Each is operated by its own 25-hp. motor through a Texrope drive. The stone

The river front opposite the Standard plant, where a dock for loading material boats would have been built



Elevation of the screening plant showing its relation to Building No. 3

passing through the screen holes drops by means of a stepped chute to conveyor No. 6, which runs across under the screens. The rejects from the screens drop to a battery of three 7-in. "Newhouse" Allis-Chalmers crushers for further reduction. These crushers are one of the latest development in this field, being a high speed unit, having a vertical motor built integrally with the crusher portion, and the whole being arranged for 3-point suspension from the framework of the building, thus reducing vibration and cutting down foundation expense. Provision was made in the design for a fourth crusher here, but it was not installed. As in Building No. 2, there are overhead trolley beams above the two screens, and another above the line of crushers.

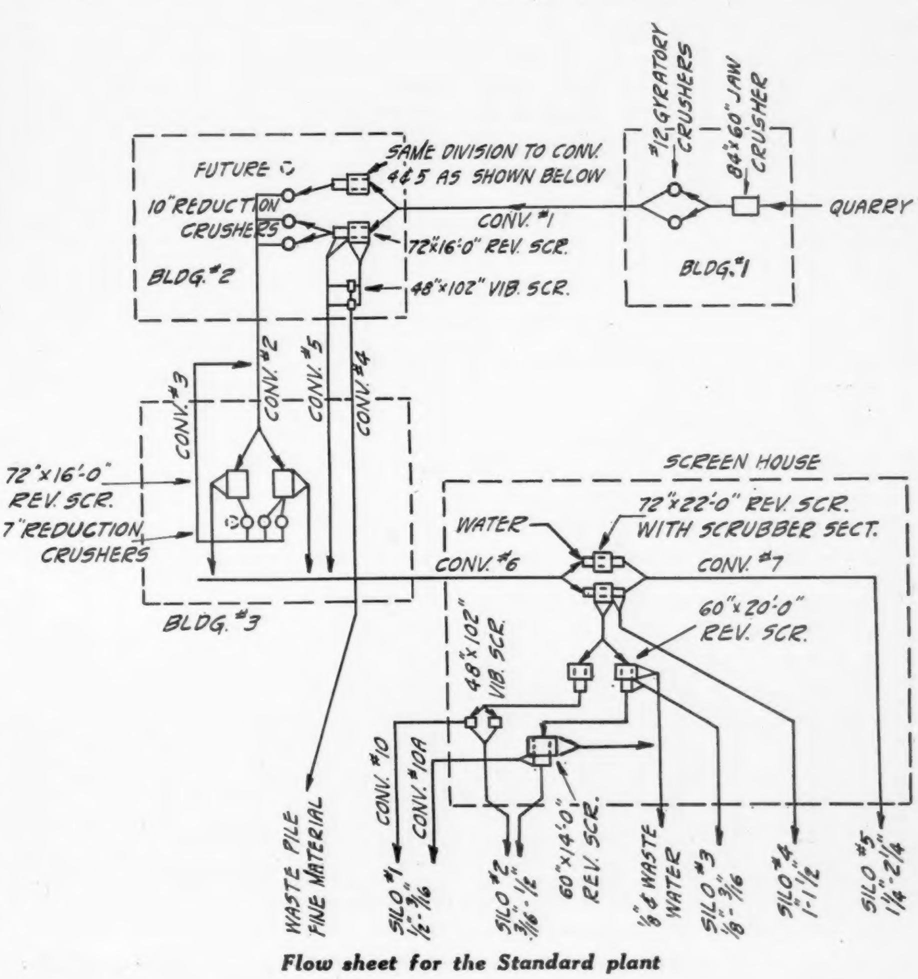
The blacksmith shop, typical of the type of sheathing used

The discharge from the three 7-in. crushers drops to a 24-in. belt conveyor inclined at an angle of 20 deg. from horizontal, which takes it up to conveyor No. 2 and discharges it to that conveyor, thus completing a closed circuit of the material through the secondary scalpers and crushers. This return conveyor is designated as No. 3.

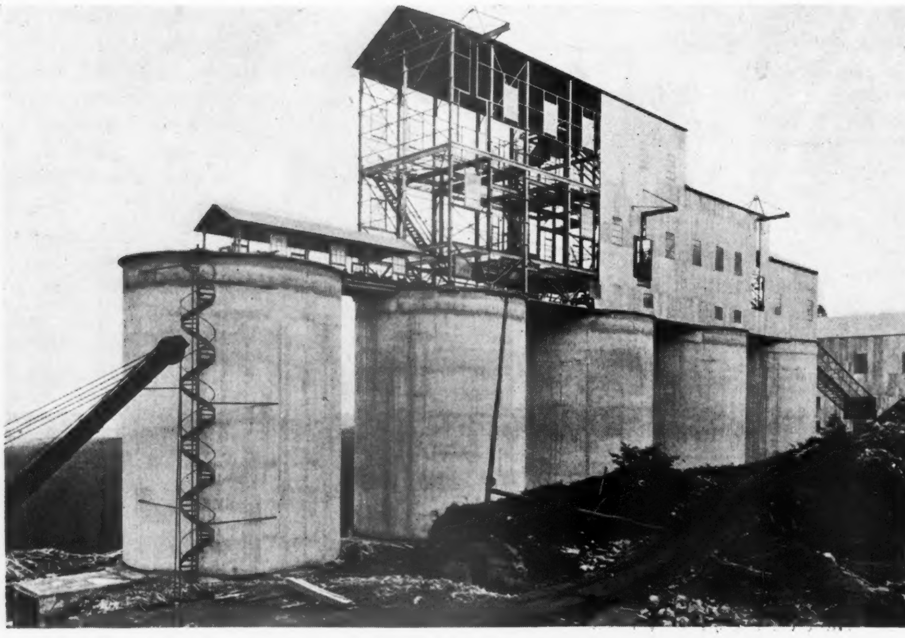
Returning to the two 24-in. conveyors from Building No. 2. As noted above, conveyor No. 4 carries the fine material from the "Gyrex" screens. It passes directly across the lower floor of Building No. 3 and discharges to a waste pile beyond. This pile is right on the edge of the swamp, and thus well below the plant level, so this makes a very convenient place to dump the material, and would in time have built up more ground on the river side of the plant. Conveyor No. 5, containing material 2½-in. down to ⅛ in., enters Building No. 3 and discharges to conveyor No. 6, which, as stated above, is the same conveyor to which is discharged the material passing the 2¼-in. holes in the pair of screens above.

Conveyor No. 6 now carries the material up to the top of the last building, which is the screen house. It is a 30-in. conveyor placed at an angle of approximately 18 deg. This belt carries all of the stone which passes through the plant, with the exception, of course, of the fine material which has gone to the waste pile.

The screen house consists of a row of five monolithic concrete silos set on 50-ft. centers, and each having an inside diameter of 36 ft., upon which stands the 3-story steel structure enclosing the sizing screens. This superstructure, however, extends over only



Flow sheet for the Standard plant



The incompleted screen house and silos, showing the entrance to the reclaiming tunnel at the left

four of the silos, the fifth one being filled by means of an enclosed conveyor from the main structure. Under all of the silos, extending from end to end of the row, is a concrete tunnel enclosing the reclaiming conveyor.

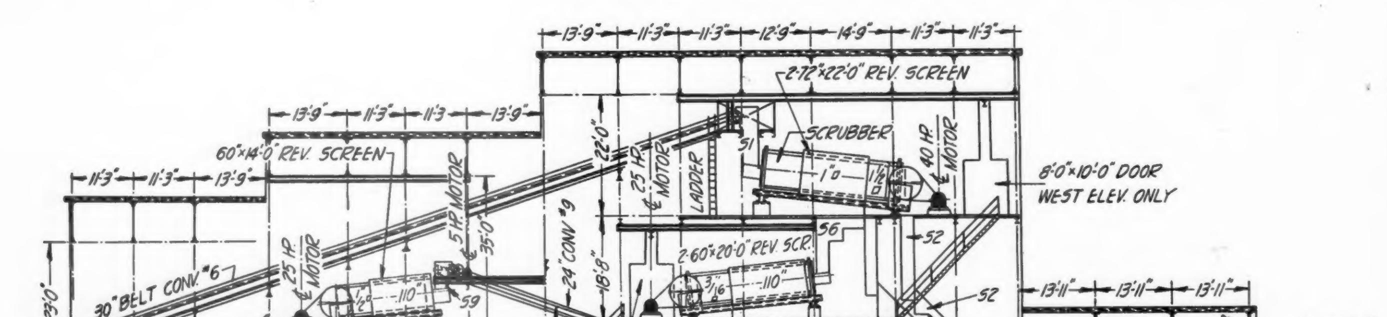
The Screen House

The conveyor from Building No. 3 delivers the stone to a hopper which divides the material evenly between two 72-in. by 22-ft. revolving screens. The first portions of these screens are scrubber sections, water being added to the material at this point. Next comes the main sections of the screens with 1½-in. square holes, and these also have jackets with 1-in. square holes. The rejects from this pair of screens drop through stepped chutes to a 24-in. belt conveyor designated as No. 7, which delivers them to silo No. 5. This material is 2¼-in. down to 1½-in. The stone which passes through the 1½-in. holes in the pair of screens, but does not pass through the jacket holes, drops at once to silo No. 4 through a metal chute. This stone is 1½-in. down to 1-in. The stone from the jackets drop through stepped chutes to another pair of screens below for further sizing. The first pair of screens are driven by two 40-hp. motors. An interesting sidelight here is that around the lower portions of the scrubber screens, where water is likely to cause trouble with the beams, all exposed parts of the beams were to be covered with a galvanized iron protection.

The water supply for washing the stone would have been drawn from the Hudson river by means of a 10-in. pump.

The second pair of sizing screens are 60-in. by 20-ft. revolving screens furnished by the Allis-Chalmers Manufacturing Co., as were all the other revolving screens in this portion of the plant. These two screens have 3/16-in. square holes in the main portions and 0.11-in. perforations in the jackets. The water and fine material passing the holes in the jackets is carried off as waste by means of a flume. The stone passing the holes in the main portion of the screen drops directly to silo No. 3 below. This is material 3/16-in. down to ⅛-in. The rejects of this pair of screens drop to a pair of conveyors, Nos. 8 and 9. Each screen is driven by a 25-hp. motor, and each conveyor is driven at its head end by a 5-hp. motor.

Conveyor No. 8 discharges to a pair of "Gyrex DD" vibrating screens, each 48x102-in. in size. Material passing through the ½-in. mesh of the screens drops directly to silo No. 2, which holds 3/16-in. to ½-in. stone. The rejects are carried by belt conveyor No. 10 to silo No. 1, which is for ½-in. to 1-in. stone. A parallel course is followed by the material on conveyor No. 9, except that it discharges to a 60-in. by 14-ft. revolving screen having a jacket. The jacket has holes 0.11-in. in size and separates the fine waste material and water which is run off in a flume. The body of the screen has ½-in. square holes, and sends the 3/16-in. to ½-in. stone directly to silo No. 2, as did



Elevation of the screen house and silos

the pair of "Gyrex" screens. The rejects from the revolving screen, ½-in. to 1-in., pass to conveyor No. 10-A, and are discharged to silo No. 5. The revolving screen is operated by a 25-hp. motor, and conveyors 10 and 10-A each have a 5-hp. motor.

In the bottoms of each silo, except the center one, there are three quadrant gates opening onto the 30-in. conveyor belt beneath, which is designated as conveyor No. 11. The center silo has only one large sliding gate with a 4-ft. 9-in. aperture. Besides these gates there are four more, one each between each adjacent pair of silos. The 30-in. conveyor is operated by a 15-hp. motor at the far end. The final conveyors, Nos. 12 and 13, at the Standard plant were to run at right angles to the reclaiming tunnel, and were to extend out across the meadow to the water front, where the dock was to have been constructed. Here a short flight conveyor, No. 14, was to project out over the water to load the boats. This conveyor was to be built so that it could be raised and lowered to meet varying loading conditions.

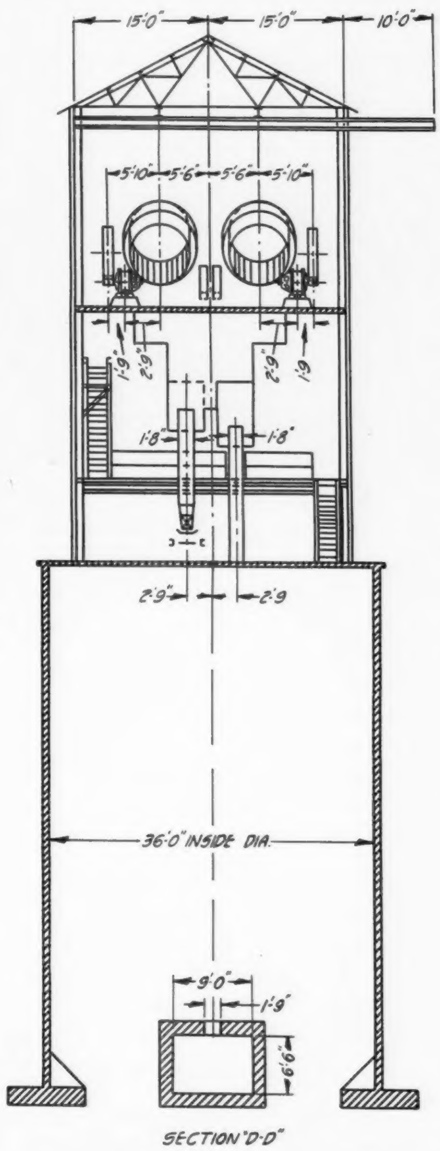
It is particularly unfortunate that this plant will never operate, as from observation of its present condition it seems to be the most outstanding plant of the year. The experience of Mr. Shaw and his associates, as well as the designing ability of the Burrell company, have made the Standard plant an exceptional achievement.

With Mr. Shaw are associated W. Butler Duncan, president, and Anderson Dana, secretary and treasurer of the Standard corporation. The superintendent at the Piermont plant was Thomas J. Lynch.

Imports Curtail Virginia Cement Plant's Output

DESPITE Belgian competition, which has cut heavily into the business of his company this year, Dwight Morgan, manager of the Virginia Portland Cement Co., Norfolk, Va., said it was probable that the company's South Norfolk plant would operate continuously during the fall and winter.

"We have been hit hard this year in our territory, Virginia and North Carolina, by imported cement which has largely been imported through Wilmington, N. C., and Charleston, S. C.," said Mr. Morgan. "As a result we were forced to shut down the plant here 40 days this spring. Since then we have operated at two-thirds capacity. It appears that we will be able to maintain that rate during the fall and winter in spite of the regular seasonal decline in cement sales,



Section showing the unusual bin construction

though it is possible we may have to curtail production to one-third capacity."

Construction this year in the Virginia-Carolina area has been fair, said Mr. Morgan, who added that he was reasonably optimistic over 1929 prospects.

"Low prices on last season's crops in this area has been a factor," said Mr. Morgan. "Undoubtedly also the presidential election has had an effect on business."

Cement manufacturers are making an effort to have the tariff on cement raised so that they can compete with the foreign-made product, said Mr. Morgan. "If we can obtain that the Norfolk plant should do well next year."—*Norfolk* (Va.) *Ledger-Dispatch.*

Walter F. Jahncke Lauds the Election of Mr. Hoover

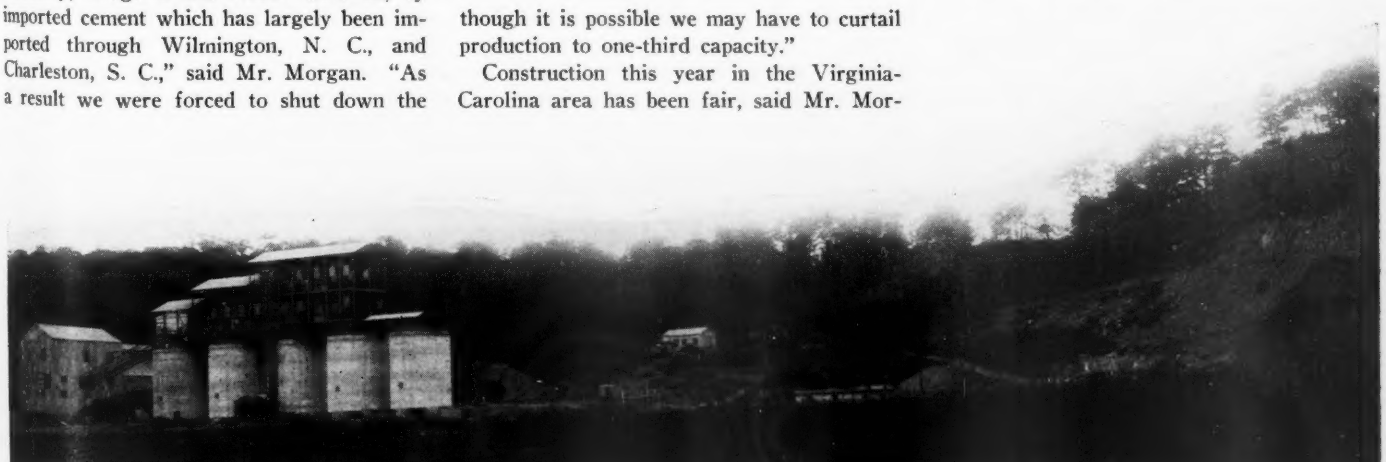
THE EDITOR (and probably other friends of Walter F. Jahncke, New Orleans, La.) received the following telegram after the recent election returns:

"Am confident Honorable Herbert Hoover's election indicates a true road of progress in accordance with his statement: 'The whole country cannot be wrong,' when north, south, east and west express their confidence in the same man, to be responsible for our destinies during the next four years. The decision must be right. Never in history has there been such universal confidence. The dawn of renewed prosperity cannot be doubted. Our industry cannot fail to share in the future prosperity. Let us building supply merchants co-operate among ourselves, with the manufacturers and the government officials, for benefit of industry as a whole."

(Signed) WALTER F. JAHNCKE,
President National Builders Supply Association.

New Missouri Silica Project

ANNOUNCEMENT was made recently that articles of incorporation had been filed under the laws of the state of Delaware by the Corona Silica, Inc., Rogers, Ark., with $750,000 capital stock. A mill is to be built in Rogers with tonnage of 300 tons daily.—*Neosho* (Mo.) *Democrat.*



The Standard plant, as it appeared early in November of this year, and the proposed quarry, to the right

Hints and Helps for Superintendents

Springing Bore Holes

WHEN it is necessary to spring bore holes heavily there is considerable likelihood of the hole raveling if left unstemmed. This condition of a hole is dangerous for loading the succeeding dynamite charges and to overcome this feature, A. E. Anderson, technical representative of E. I. du Pont de-Nemours and Co., Inc., in that company's October, 1928, Bulletin, calls attention to the methods used by Thomas Marshall of Bailey, Colo. This superintendent drilled the holes 18 to 20 ft. deep and sprung them three times or more, until the chamber resulting would hold the amount of quarry gelatine necessary to give the desired shatterability. Each spring shot was stemmed with burned, thoroughly dry, fine sand, the bore hole being filled to the collar after each loading. After springing, the dry, fine sand was blown out of the bore hole by a blow pipe.

The advantages of this method are that the confined force of the explosive is exerted towards expanding the powder pocket and not in raveling the stem of the bore hole.

Magnetic control panel for operation of electric hoist

An Electric Incline Hoist for Railroad Hopper Cars, with Push-Button Control

D. W. Yambert
Mechanical and Electrical Engineer, France Slag Co., Toledo

THE new East Toledo plant of the France Slag Co., Toledo, Ohio, is equipped with an electric push-button-controlled incline hoist for elevating 50-ton capacity railroad hopper cars. The incline is about 190 ft. long and has a slope of about 3 in. to the foot. The hoisting speed is 100 ft. per minute. A 1¼-in. plow steel hoisting cable is used, the end of the cable being equipped with a clevis fitting to fasten to the car coupler. A 36 in. wide by 36-in. diameter cast iron grooved winding drum mounted on an 8-in. diameter shaft receives and pays out the cable. One layer of cable across the drum would be sufficient for the operation but a layer and a half is used in order that the cable will be winding on the center of the drum as the car reaches the top of the incline.

Speed reduction from the motor to the winding drum is accomplished through three sets of spur gears as follows:

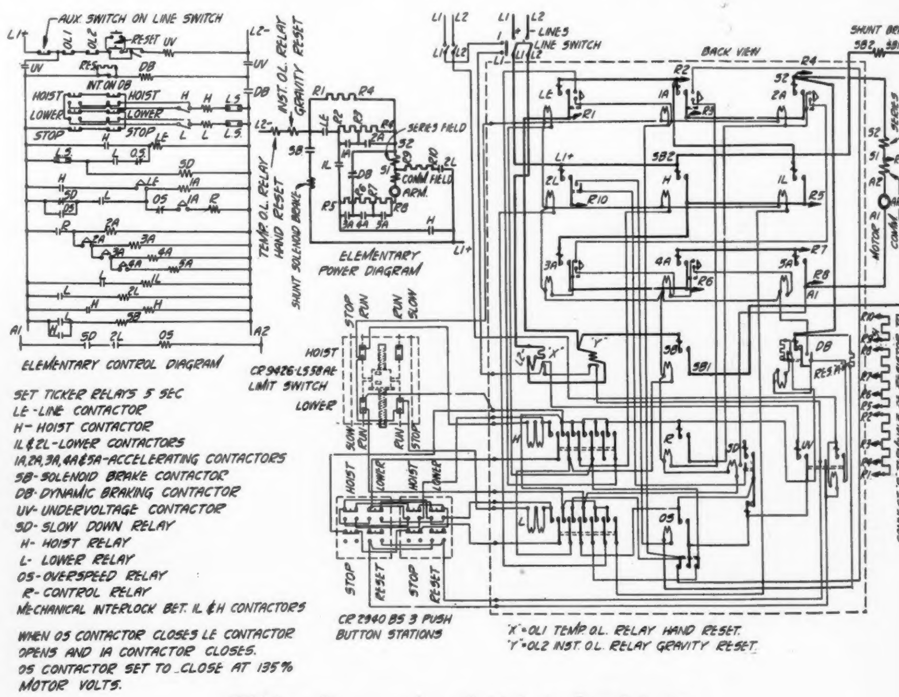
72-tooth, 3-in. pitch, 9-in. face, cast steel gear to 15-tooth, 3-in. pitch, 9-in. face, cast steel pinion.

75-tooth, 2-in. pitch, 6-in. face, cast steel gear to 14-tooth, 2-in. pitch, 6-in. face, cast steel pinion.

42-tooth, 2 diametral pitch, 6-in. face, cut steel gear to 19-tooth, 2 diametral pitch, 6-in. face, cut steel pinion.

A 40-in. diameter by 8-in. face brake wheel is mounted on the same shaft that carries the 15-tooth, 3-in. pitch, cast steel pinion. The wheel is fitted with a hand-lever-operated, theremoid-lined brake band. This hand-operated brake is for emergency use only.

The 19-tooth, 2 diametral pitch, cut steel pinion is mounted directly on the shaft of a 100-hp., General Electric, 230-volt, series-wound, 600-r.p.m., totally enclosed, mill type motor. A gravity set, shunt-wound, solenoid brake is mounted on the opposite motor shaft extension. This brake has sufficient torque to hold a loaded car at any point along the incline.



Wiring diagram for electric inclined hoist

Structural steel was used to construct the hoist frame, the main members being 12-in., 50-lb., I-beams. The hoist was designed by the France Slag Co.'s own engineers. The patterns and castings and the construction of the hoist was handled by the France Foundry and Machine Co.

Grooves were placed on the pattern for the winding drum by wrapping groove moulding around the drum and nailing it in place. The groove moulding was slotted in the bottom with numerous saw cuts to facilitate bending it around the drum.

The hoist is controlled through a General Electric, steel-enclosed, magnetic-control panel. Starting and stopping in either the hoisting or lowering direction are controlled

by means of push-buttons. All other functions of the control, such as accelerating, slowing down, and protecting against over-speed, over-travel, under-voltage, and overload are entirely automatic. Time limit acceleration is used and is accomplished through pendulum-actuated relays. There is dual overload protection consisting of an instantaneous overload relay to protect against exceptional peak overloads, and a temperature overload relay to protect against more or less continuous overloads. The instantaneous overload relay can be reset by a button at the push-button station.

Two men are required for the hoisting of cars, one at the foot of the incline to change the cable from the empty car to the loaded car, and one at the top to operate the push-button station and dump the car.

During hoisting the motor operates as a simple series motor. Lowering, however, requires some braking effort and the motor is therefore reconnected during lowering to provide dynamic braking. (Dynamic braking is the retarding force brought about by causing the motor to generate current through a resistor. The greater the resistance the less current will flow and therefore the less retarding effort will be had.) The connections are such that at the beginning of lowering, the motor acts as a motor in order to start the car down the incline. As the car attains speed the motor becomes a generator, generating current through the resistor, thus opposing the rapid acceleration of the car speed. Should the car attain too great a speed such as to cause the motor to generate 135% of normal voltage, an overspeed relay will operate removing some resistance from the braking resistor and therefore causing greater generation of current and greater retarding force, which in turn slows the car down again to a safe speed.

A geared-type limit switch is driven by chain from one of the intermediate shafts of the hoist. The contacts of the limit switch are so adjusted and connected as to prevent dangerous overtravel in either the hoisting or lowering direction, and also to provide for slowing down the car in the lowering direction as it nears the bottom of the incline just prior to the stopping of the car.

Removing Kettle Bottoms with Dynamite

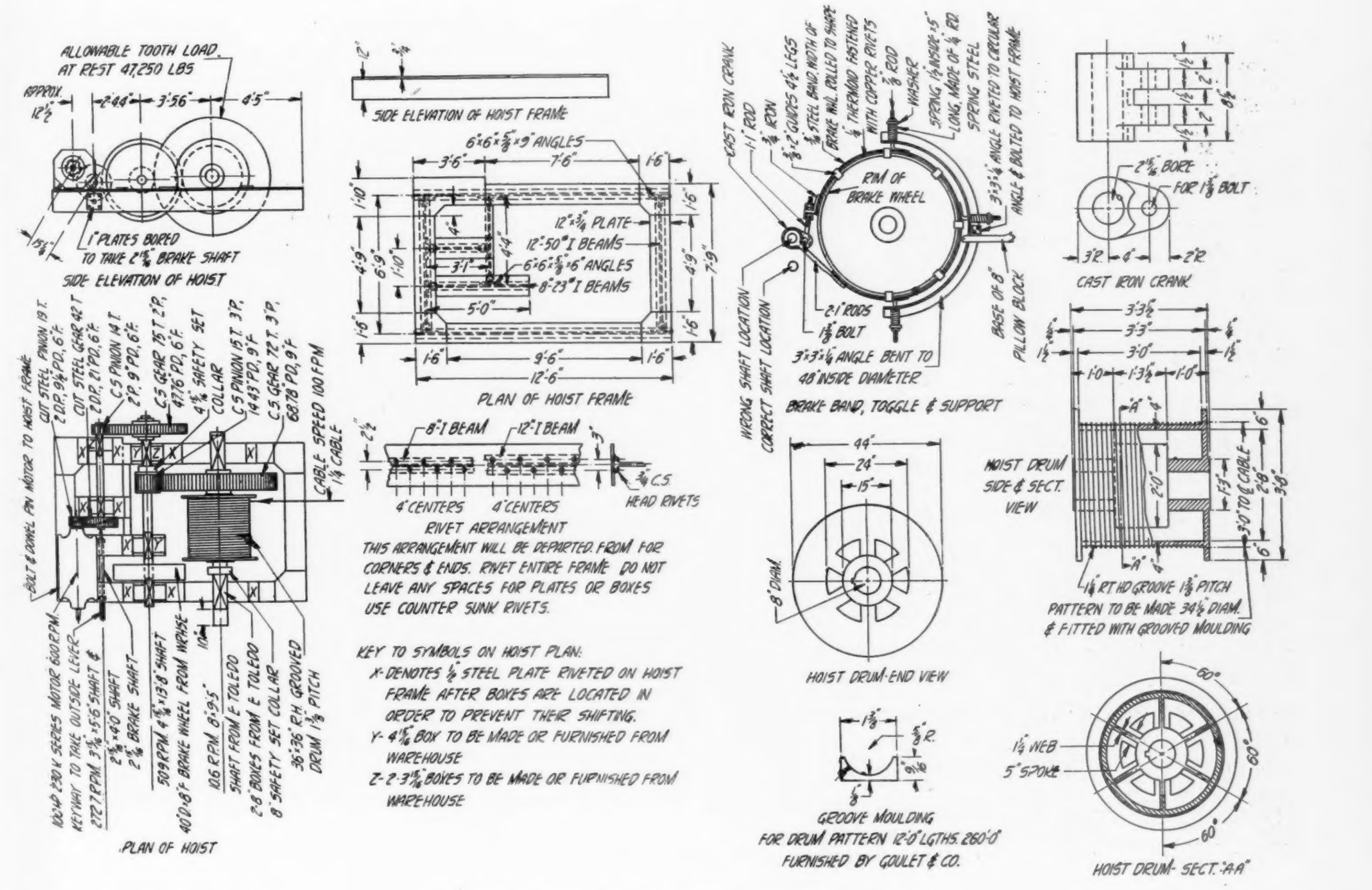
THERE are two well-known types of gypsum kettle bottoms, the one-piece solid casting and the seven-piece sectional bottom. The third and less well-known bottom consists of a single piece of pressed steel plate 1 in. to 1¼ in. thick. This type has been in use for several years and has proven a remarkable success.

In removing a solid cast bottom from a two above two, flue kettle, the flues, rabble mechanism and top housing were removed, and the cracked solid bottom shot out with dynamite. The pieces thus broken were left in the fire box and pulled out through the fire door later.

The charge used, or series of charges, consisted of two sticks of 40% gelatine dynamite placed 18 in. from the settle shell and mud capped with 50 lb. of mud stemming. This broke a hole through at that point, roughly a foot in diameter. The next charge was laid alongside of this hole and exploded and the process continued until the residual pieces fell into the fire box. About 15 separate shots are required.

There was no damage done to the brickwork, nor did the wing wall collapse, as might be supposed. The writer has shot out several bottoms by this method with no harmful results, and with a great saving in time and expense.

In one instance an old bottom was removed and a new one installed, and the kettle back in service in an elapsed time of 53 hours from the time the heat turned off until the kettle fire started again. This was possible, as no one had to go into the lower fire box portion of the kettle the first 24 hours, as all the reinstalling was done from above.—WALTER B. LENHART.



Detail drawings of the France Slag Co. hoist

Sand-Lime Brick Production and Shipments in October

THE following data are compiled from reports received direct from 25 producers of sand-lime brick located in various parts of the United States and Canada. The number of plants reporting is one less than those furnishing statistics for the September estimate published in the October 27 issue. The statistics below may be regarded as representative of the entire industry, the reporting plants having about one-half the production capacity in the United States and Canada.

An unusual trend is shown in production in the sand-lime brick industry for October. Although the winter season is rapidly approaching, the figures show a considerable higher production than was found in the preceding month, even though five plants reported they were not in production. Shipments (rail and truck combined) show a fair increase also over the September figures. However, the amounts of unfilled orders as well as the stocks on hand remain practically the same as for the previous month. There are no changes in price of any consequence since the September figures were published.

The following are average prices quoted for sand-lime brick in October:

Average Prices for October

Shipping Point	Plant Price	Delivered
Albany, Ga.	$10.00	....
Boston, Mass.	12.00	15.00
Buffalo, N. Y.	12.25	16.50
Dayton, Ohio	12.50	15.50
Detroit, Mich.	....	16.00
Detroit, Mich.	....	15.50@16.00
Detroit, Mich.	12.35	15.50
Detroit, Mich.	13.00@14.00	15.50@16.00
Detroit, Mich.	....	....
Flint, Mich.	....	....
Grand Rapids, Mich.	12.50	....
Jackson, Mich.	12.25	....
Menominee, Mich.	11.00	14.50
Milwaukee, Wis.	10.50	13.00
Mishawaka, Ind.	11.00	....
New Orleans, La.	....	....
Pontiac, Mich.	12.00	14.00
Rochester, N. Y.	....	....
Saginaw, Mich.	12.00	....
Sebewaing, Mich.	....	....
Sioux Falls, S. D.	....	....
Syracuse, N. Y.	....	....
Toronto, Canada	12.50	15.00
West Toronto, Canada	12.30	15.00
Winchester, Mass.	....	16.00

The following statistics are compiled from data received direct from 25 producers of sand-lime brick in the United States and Canada:

Statistics for September and October

	*September	†October
Production	17,266,500	21,589,800
Shipments (rail)	6,767,300	5,562,300
Shipments (truck)	11,281,400	15,801,600
Stocks	15,304,100	14,446,100
Unfilled orders	14,455,000	13,435,000

*26 plants reporting.

†Incomplete, one plant not reporting stocks and eight plants not reporting unfilled orders.

Bessemer Cement Company's Employes Hold Safety Rally

CO-OPERATING with the Western Pennsylvania Safety Council in its November drive for a reduction of industrial accidents, the plants of the Bessemer Limestone and Cement Co. and the Metropolitan Paving Brick Co. of Bessemer, Penn., held a safety rally in the Bessemer high school, November 20. James A. Kilty of Pittsburgh was the speaker.

Both these concerns are doing active safety work and the cement plant of the Bessemer Limestone and Cement Co. has operated a full two years with but two lost time accidents.

The meeting will be in charge of Roy C. Wallis of the Metropolitan Paving Brick Co. and A. J. Eales of the Bessemer Limestone and Cement Co.—*Youngstown* (Ohio) *Vindicator.*

W. H. Green Appointed Works Manager of Pacific Coast Cement

ANNOUNCEMENT was made November 10 by N. D. Moore, vice-president of the Pacific Coast Cement Co., that W. H. Green had been selected works manager. He will have complete charge of the operations of the new plant that has been constructed in Seattle at a cost of over $3,000,000. It is the first product, Diamond portland cement, that will be on the market early in January, it is expected by officials.

Mr. Green is a graduate of the University of Michigan and has spent over 20 years in the cement industry. He has constructed and operated the plants of the Knickerbocker Portland Cement Co. at Hudson, N. Y., Canada Cement Co., at Montreal, Trinity Portland Cement Co. at Dallas and in 1921 was selected to construct and operate the mammoth plant of the Jubbulpore Portland Cement Co. in India.—*Seattle* (Wash.) *Journal of Commerce.*

Beg Your Pardon!

IN the sand-lime brick department of ROCK PRODUCTS for October 27, 1928, there was a picture of the Fort Garry hotel in Winnipeg, Canada, and the accompanying paragraph stated that the building was entirely faced with sand-lime brick. Since that issue appeared two of our readers in Winnipeg have written to inform us that this hotel is faced with stone, although some of the back walls are of sand-lime brick. The picture reproduced in ROCK PRODUCTS, as well as the accompanying data, was obtained from a bulletin of the Sand-Lime Brick Association, which unfortunately seems to have been in error on this point. We are very sorry the mistake occurred.

Ohio Safety Congress a Success

THE Second Annual Ohio Safety Congress was held at Columbus on November 13, 14 and 15. Although this congress covers all phases of safety, the rock products field was well represented with safety work among the quarry operators and cement plants. The Ohio congress is getting to take on an appearance similar to the national congress, at least in size and character of the speakers obtained to address the various sessions, and undoubtedly is one of the most important of the state safety gatherings. This year's congress was so large that it required three days to cover the ground, instead of two, as were needed a year ago.

Asphalt Paving Conference

AN announcement from the Asphalt Association states that the Seventh Annual Aphalt Paving Conference is to be held at the Roosevelt hotel in New Orleans on December 3 to 7, 1928. The five-day program will be given over to papers by well known engineers and other authorities, with particular emphasis on the economics of asphalt paving and the service rendered by this type of paving. One session will be devoted to a discussion of the research work being carried on to bring more definite light on the practical problems of paving. The conference is to be held under the auspices of the Asphalt Association and the Association of Asphalt Paving Technologists.

Arizona Asbestos Mine Reported Sold

THE Bear Canyon asbestos properties are reported by the *Los Angeles* (Calif.) *Times* to have been recently sold to Dr. R. V. Mattison, of Ambler, Penn., of the Bell Asbestos Co. of Canada and president of companies manufacturing asbestos products at Ambler.

The asbestos is said to be a high grade crysotile. The locality already has a small production of asbestos of spinning grade, and the same report says that a mill for crushing and cleaning the fiber is to be erected shortly.

One of Neal Gravel Company's Indiana Plants Damaged by Fire

FIRE of unknown origin recently destroyed the Neal gravel plant at the pit, a mile east of Wolcottville, Ind., on the Wabash railway.

The Wolcottville fire department was called, but the men were unable to check the fire.

The loss is estimated at several thousand dollars and is covered by insurance.—*La Grange* (Ind.) *Standard.*

Editorial Comment

The Ethics of Promotion

The problem of bringing about decent, moral or ethical competition will not be solved merely by such modifications of the Sherman and other anti-trust laws as will enable competitors within an industry to so agree and contract with one another as to insure reasonable profits without detriment to the public. If any considerable number of competitors is involved in such an agreement a fair and reasonable profit will be a profit that will permit the least efficient to make a living. Consequently, the industry will be more attractive than ever to the promoter who can, or thinks he can, or who can induce others to think he can, produce cheaper and better than some of those already established.

Do you established producers want to keep him out; if so, how are you going to do it? Obviously there are but two ways he can be kept out—by persuasion or by law. He may be persuaded that the industry does not need his plant; his financial backers may be dissuaded from supporting the project; he may be persuaded to exercise his talents and spend his money by taking over a going proposition. Or we may have a government statute prohibiting him from engaging in any industry, until some government or otherwise appointed board or commission passes on his qualifications and the merits of his project. The latter smacks of something very un-American, and probably would not prove very popular; but it may ultimately become a necessity unless some other curb be devised for the *professional* promoter.

If the promoter, or the proposer, of a new plant must manage it and live by it, he will not build a new producing unit without having justified its need or desirability, at least to his own satisfaction. Unfortunately for all American industry there are men who live by promoting rather than by producing. The problem is to restrain these professional promoters without unnecessarily handicapping the ambitious man with a legitimate and really necessary enterprise—without restricting our most prized American heritage of equality of opportunity!

Here again we believe the future of American industry lies in self-government, and not in appealing to the government for restraining laws. It is conceivable that the industrial associations and local chambers of commerce of today may eventually become instruments for the promotion of legitimate enterprises, and effective factors in the suppression of unnecessary, uneconomic ones—through the exercise of common sense, intelligence and honesty. There also we have an ideal for American business and industrial associations to attain, at least in part, to justify their continued existence.

The Aggregate Situation

An editorial in the English *Stone Trades Journal* (reprinted in Rock Products, October 27) points out the necessity of bringing up the quality of British aggregates to compare with the quality of British portland cement, and it says that in self-defense British portland cement manufacturers may be compelled to go into the aggregate business to be sure their product is not discredited by being used with poor aggregates.

There is no such need in the United States. Thanks to the intensive study of concrete made by many engineers, and especially to the work of Duff A. Abrams and his associates in the Portland Cement Association laboratories, the important part played by aggregates in making concrete was early recognized. Highway engineers followed this up with work on local materials and set standards as high (generally) as the deposits of available raw materials would permit them to be. Of late the co-ordination of the producers' problems with those of the users of aggregate has been the subject of much productive research by the engineering divisions of the National Sand and Gravel and the National Crushed Stone Associations. As a result the aggregate situation in this country is somewhat extraordinary, when its size and the diversity of geological conditions are taken into account. Only ignorance so crass as to be almost criminal is responsible today for spoiling good cement by combining it with poorly prepared or otherwise unfit aggregate.

The achievement of this countrywide situation is a real triumph, not only of engineering skill but of the co-ordination and co-operation in the production and use of aggregate. For no such result could have been obtained without organizations, not only the producers' organizations previously mentioned but the bodies of wider membership, the American Society for Testing Materials and the American Concrete Institute. In such organizations producers and consumers meet, both agreeing on what is ideal and equally agreeing on the limitations set by nature to fulfilling those ideals.

American portland cement manufacturers have not found it necessary to go into the aggregate business in self-defense, and so long as the various interested organizations keep up their work they never will. In the few instances where cement companies have entered the aggregate business on any scale they have gone into it as has any other producer, with the hope of profit. There is no need that cannot be supplied by our established aggregate industry, and there is no industry in the land that is more forward-looking or that tries more earnestly to give the public material of high quality than our established mineral aggregate industry.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. com.[37]	12-30-27	3	7	
Allentown P. C. 1st 6's[29]	11-19-28	90	....	
Alpha P. C. new com.	11-19-28	49	51	75c qu. Oct. 15
Alpha P. C. pfd.[2]	11-19-28	116	....	
American Aggregates com.	11-19-28	....	50	75c qu. Dec 1
Amer. Aggregate 6's, bonds	11-19-28	115¼	117	
American Brick Co.	11-19-28	17	18	25c qu. Nov. 1
American Brick Co. pfd.	11-19-28	91	94	50c qu. Nov. 1
Am. L. & S. 1st 7's[20]	11-19-28	100½	102	
American Silica Corp. 6½'s	11-21-28	96	100	
Arundel Corp. new com.	11-21-28	43	44	50c qu. Oct. 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	11- 7-28	105	108	
Atlas P. C. com.	11-19-28	44	46	50c qu. Dec. 1
Atlas P. C. pfd.	11-19-28	46	....	66⅔c qu. July 2
Beaver P. C. 1st 7's[20]	11-15-28	98½	99	
Bessemer L. & C. Class A[4]	11-19-28	36½	37½	75c qu. Nov. 1
Bessemer L. & C. 1st 6½'s[4]	11-19-28	100¼	100¾	
Bloomington Limestone 6's[29]	11-19-28	93½	96	
Boston S. & G. com.[16]	11-17-28	76	81	$1 qu. July 2
Boston S. & G. 7% pfd.[16]	11-17-28	83	85	1¾% qu. July 2
Boston S. & G. Co. 1st pfd.[16]	11-17-28	92	95	2% qu. July 2
Canada Cem. com.[43]	11-19-28	32⅝	33¼	
Canada Cement pfd.[43]	11-19-28	98	99	$1.62½ qu. Sept. 30
Canada Cement 5½'s	11-17-28	101½	102¼	
Canada Cr. St. Corp. 1st 6½'s	11-16-28	....	96	
Canada Gyp. & Alabastine	11-19-28	74½	75	75c Oct. 1
Certainteed Prod. com.	11-20-28	31	32	$1 qu. Oct. 1
Certainteed Prod. pfd.	11-21-28	75	90⅛	1.75 qu. Oct. 1
Cleveland Stone new st'k	11-16-28	56	60	50c qu. Dec. 1 & 25c ex.
Columbia S. & G. pfd.	11-19-28	91⅝	91¾	
Consol. Cement 1st 6½'s, A[42]	11-20-28	94	99	
Consol. Cement 6½ notes	11-20-28	91	95	
Consol. Cement pfd.[29]	11-19-28	65	75	
Consol. S. & G. com. (Canada)	11-19-28	17	18	
Consol. S. & G. pfd. (Canada)	11-19-28	91	91½	1¾% qu. Nov. 15
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	11-16-28	98	99½	
Coosa P. C. 1st 6's[29]	11-19-28	50	55	
Coplay Cem. Mfg. 1st 6's[40]	11-19-28	90	....	
Coplay Cem. Mfg. com.[40]	11-19-28	15	....	
Coplay Cem. Mfg. pfd.[40]	11-19-28	75	....	
Dewey P. C. 6's[30]	11-21-28	99	....	
Dolese & Shepard[7]	11-21-28	122	128	$2 qu. Oct. 1; $1 ex. Oct. 1
Edison P. C. com.[19]	10-19-28	25c	....	
Edison P. C. pfd.[19]	10-19-28	1	....	
Edison P. C. bonds[19]	11- 2-28	65	75	
Fredonia P. C. 1st 6½'s[32]	12-28-27	97	101	
Giant P. C. com.	11-19-28	25	30	
Giant P. C. pfd.	11-19-28	33	38	3½% June 15
Ideal Cement, new com.	11-17-28	88	91	75c Oct. 1
Ideal Cement 5's, 1943	11-17-28	116	120	
Indiana Limestone 6's	11-20-28	90¼	91½	
International Cem. com.	11-20-28	83½	84	$1 qu. Sept. 28
International Cem. bonds 5's	11-20-28	104	104¾	Semi-ann. int. payable June 15
Iron City S. & G. bonds 6's[46]	11-17-28	97	99	
Kelley Is. L. & T. new st'k	11-20-28	56½	....	62½c qu. Oct. 1
Ky. Cons. Stone Co. com.[48]	11-15-28	13	15	
Ky. Cons. St. com. Voting Trust Certif.[48]	11-15-28	13	15	
Ky. Cons. Stone 6½'s[48]	11-15-28	96	100	
Ky. Cons. St. Trustee Certif.[48] (1 sh. 7% cum. pfd. & 1 sh. com. stock)	11-15-28	99	101	$1.75 Aug. 1
Keystone Sand & Sup. 6's[47]	8-22-28	99	100	
Lawrence P. C.[2]	11-19-28	96	101	2% qu. Sept. 29
Lawrence P. C. 5½'s, 1942	11- 8-28	95	97	
Lehigh P. C.[2]	11-20-28	56	57	62½c qu. Feb. 1
Lehigh P. C. pfd.[2]	11-20-28	107¼	109	1¾% qu. Jan. 1
Lyman-Richey 1st 6's, 1932[13]	11-16-28	98½	100	
Lyman-Richey 1st 6's, 1935[13]	11-16-28	97½	99	
Marblehead Lime 1st 7's[14]	11-16-28	100	....	
Marbleh'd Lime 5½'s, notes[14]	11-16-28	98½	100	
Material Service Corp. 6's	11- 8-28	99	100	
Mich. L. & C. com.[6]	11-16-28	35	....	
Missouri P. C.	11-20-28	42	43	50c qu. Aug. 1
Monolith Midwest[9]	11-15-28	8	10	
Monolith P. C. com.[9]	11-15-28	13¾	14¼	8% ann. Jan. 2
Monolith P. C. pfd.[9]	11-17-28	9¾	....	
Monolith P. C. units[9]	11-15-28	31¾	33¼	
National Cement 1st 7's[38]	11-19-28	99	101	
National Gypsum A com.[35]	11-21-28	17	21	
National Gypsum pfd.[35]	11-22-28	....	55	1¾% qu. Apr. 1
Nazareth Cem. com.	11-16-28	28	32	75c qu. Apr. 1
Nazareth Cem. pfd.	11-16-28	100	....	
Newaygo P. C.[1]	12-30-27	115	....	
Newaygo P. C. 1st 6½'s[20]	11-19-28	101	....	
New Eng. Lime pfd., A[41]	10- 6-28	....	90	
New Eng. Lime pfd., B	11- 2-28	97	99	
New Eng. Lime com.	11- 2-28	25	30	
New Eng. Lime 1st 6's[14]	11-16-28	98	100	
N. Y. Trap Rock 1st 6's	11-20-28	100⅝	101	
North Amer. Cem. 1st 6½'s	11-21-28	70½	71½	
North Amer. Cem. com.	11-20-28	6	8	
North Amer. Cem. 7% pfd.	11-20-28	23	27	$1.75 qu. Aug. 1
North Amer. Cem. units	11-20-28	26	31	
North Shore Mat. 1st 5's[15]	11-22-28	98½	....	
Northwestern States P. C.[37]	11-17-28	195	208	
Pac. Coast Cem. 6's, A	11-15-28	96½	98½	
Pacific P. C. com.	11-17-28	22¼	....	
Pacific P. C. pfd.	11-17-28	78	....	1.62½ qu. Apr. 5
Pacific P. C. 6's	11-15-28	99	100½	
Peerless Egyp'n P. C. com.[21]	11-19-28	1½	2½	
Peerless Egyp'n P. C. pfd.[21]	11-19-28	75	85	1¾% qu. July 1
Penn-Dixie Cem. 1st 6's[29]	11-21-28	95¾	....	
Penn-Dixie Cem. pfd.[28]	11-21-28	83	84	1.75 qu. Dec. 15
Penn-Dixie Cem. com.	11-21-28	19½	20	50c qu. July 1
Penn. Glass Sand Corp. 1st 6's. 1952	11- 8-28	103	105	
Penn. Glass Sand pfd.	11- 8-28	110	....	
Petoskey P. C.	11-21-28	10	10½	1½% qu.
Riverside P. C. com.	11-17-28	20	....	
Riverside P. C. 1st pfd.	11-15-28	95	97	1.50 Aug. 1
Riverside P. C., A	11-17-28	18	....	31¼c cum. part. Aug. 1
Riverside P. C., B	11-15-28	1	2	
Rockland-Rockport Lime 1st pfd.[10]	5-17-28	....	100	3½% s.-a. Feb. 1
Rockland-Rockport Lime 2nd pfd.[10]	5-17-28	....	60	3% s.-a. Feb. 1
Rockland-Rockport Lime com.[10]	....	no market		1½% qu. Nov. 2
Sandusky Cem.	11-16-28	....	225	$2 qu. July 2
Santa Cruz P. C. bonds	11-15-28	105¾	....	6% annual
Santa Cruz P. C. com.	11-17-28	92	....	$1 qu. Oct. 1
Schumacher Wallboard com.	11-17-28	17½	18½	50c May 15
Schumacher Wallboard pfd.	11-17-28	....	25	
Southwestern P. C. units[44]	11- 1-28	270	....	
Superior P. C., A[20]	11-15-28	47½	48½	27½c qu. Dec. 1
Superior P. C., B[20]	11-15-28	44	44½	
Trinity P. C. units[37]	11-17-28	155	160	
Trinity P. C. com.[37]	11-17-28	52	....	
U. S. Gypsum com.	11-21-28	75½	76½	2% qu. Dec. 31
U. S. Gypsum pt. paid	11-21-28	50¼	52	
U. S. Gypsum pfd.	11-22-28	128	130	1¾% qu. Dec. 31
Universal G. & L. com.[3]	11-21-28	50c	1	
Universal G. & L. pfd.[3]	11-21-28	....	10	1½% Feb. 15
Universal G. & L., V.T.C.	11-21-28	no market		
Universal G. & L. 1st 6's[3]	11-21-28	50	60	
Vulcanite P. C. 1st 7½'s[32]	12- 5-27	105	109	
Chas. Warner com.	11-19-28	43	46	50c qu. Oct. 10 & 25c ex.
Chas. Warner pfd.	11-19-28	109	....	1¾% qu. Oct. 25
Whitehall Cem. Mfg. com.[36]	11-16-28	....	75	
Whitehall Cem. Mfg. pfd.[36]	11-16-28	....	50	
Wisconsin L. & C. 1st 6's[15]	11-22-28	100	....	
Wolverine P. C. com.	11-20-28	6	....	15c qu. Nov. 15
Yosemite P. C., A com.[20]	11-15-28	4¾	5½	

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., Detroit. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick and Co., Montreal, Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, New York City and Chicago. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney Williams & Co., Inc., Los Angeles, Calif. [46]Stein Bros. & Boyce, Baltimore, Md. [47] Bank of Pittsburgh, Pittsburgh, Pa. [48]E. W. Hays & Co., Louisville, Ky.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pref. (sand-lime brick) 16 sh.[6]	par 25	25¾
Benedict Stone Corp. (cast-stone), 50 pfd., 390 com.[1]	$400 for the lot	....
Benedict Stone Corp. 1st 7's 1934[8]	....	86
International Portland Cement Co., Ltd., pfd.	30	45
Knickerbocker Lime Co.[4]	105	....
River Road Sand and Gravel Co.,[9] 200 shares	$21 per share	
Simbroco Stone Co.,[10] 10 sh. pfd., par $50	$10.25 per sh.	
Southern Phosphate Co.[6]	1¼	....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	....
Wabash Portland Cement Co.[1]	60	100
Winchester Brick Co., pfd., sand lime brick[5]	10c	....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price obtained at auction by Weilupp-Bruton and Co., Baltimore, Md. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [5]Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass. [8]Auction sales of $1000, Barnes & Lofland, Philadelphia, March 31, 1928. [10]Price at auction, June 6, 1928, R. L. Day & Co., Boston, Mass.

Initial Dividend on American Aggregates Corp. Common

AMERICAN AGGREGATES CORP., Greenville, Ohio, declared an initial quarterly dividend of 75 c. a share on the common stock payable December 1 to stockholders of record, November 20. The common no par value stock is to be listed on the New York curb. There are outstanding $1,600,000 15-year 6% gold debentures carrying stock purchase warrants of the original issue of $2,000,000 offered last spring. The American Aggregates Corp. is the successor to the Greenville Gravel Corp.

American Agricultural Chemical Co. Has Remarkable Comeback

THE American Agricultural Chemical Co. and subsidiary companies report for the year ended June 30, 1928, consolidated net income of $2,027,650 (this does not include profit of $1,029,963 from the sale of the Charlotte Harbor and Northern Railway Co., which amount has been added to the reserve for contingencies and federal taxes) after depreciation, depletion and interest charges, equal to $7.13 a share on the $28,455,200 6% cumulative preferred stock, on which no dividends have been paid since April, 1921. This compares with net loss of $1,924,134 in the preceding fiscal year.

Conditions More Satisfactory

Robert S. Bradley, chairman of the board of the American Agricultural Chemical Co., in his remarks accompanying the annual report of the company, said in part:

"Conditions in the fertilizer industry were more satisfactory than the previous year, both as regards demand and prices, which are reflected in the profit and loss account of your company. The net operating profit for the year, after setting aside the usual reserves for depreciation, discounts and possible losses on outstanding receivables, amounted to $3,519,794. From this amount there has been deducted $1,282,143 for interest paid and accrued on funded debt, having a net operating profit after interest of $2,347,650 for the fiscal year 1928.

"Competition, however, was severe in many sections, particularly in the cotton states, and although the total volume of trade of all states is estimated to have increased nearly 20%, the tonnage sales of the company were somewhat less than those of 1927, owing to the decision of your management, for the time being, not to meet the irresponsible and price-cutting competition which developed during the past spring season.

"Conditions in Cuba have shown little or no improvement during the past year, owing to the depressed state of the sugar industry, and sales and collections in that division have been disappointing.

Practically Entire Amount Collected

"Practically the entire amount of the $2,000,000 set up on June 30, 1924, as the estimated value of all past due receivables of 1921 and prior years, has been collected and the remaining small balance, which is collectible, will no longer be shown separately on the balance sheet."

"During the past fiscal year," said Mr. Bradley, "the bonded debt of the company has been decreased, through purchases, redemption by call and sinking fund operations, by $7,344,000. On August 1, 1928, the bonded debt was further reduced by $2,500,000 par value of bonds, retired by call, which, with bonds purchased and now held in the treasury, reduces the bonds in the hands of the public to $9,834,500 as of that date, making a total decrease in the bonded debt of $25,178,000 since June 30, 1923."

Consolidated income account for the fiscal year compares:

	1928	1927	1926
Gross operating profit	$ 5,301,905	$ 2,106,605	$ 5,303,444
Reserved for discounts, etc.	660,150	1,394,439	1,146,020
Depreciation and depletion	1,121,961	1,064,129	1,082,310
Interest paid and accrued	1,282,144	1,572,173	2,051,402
Premium bonds retired	210,000	....	....
Net income	$ 2,027,650	*$1,924,134	$ 1,023,712
Previous deficit	18,760,659	16,836,525	17,860,238
Final deficit	$16,733,009	$18,760,659	$16,836,525

*Loss.

Total Assets $76,977,568

The consolidated balance sheet as of June 30, 1928, showed current assets of $25,536,930, compared with $24,751,830 as of June 30, 1927; current liabilities, $1,351,013, against $1,711,472, leaving net working capital of $24,185,917, against $23,040,358.

ASSETS—	1928	1927	1926
Cash	$ 5,808,621	$ 6,749,003	$ 7,499,708
U. S. Liberty bonds	25,000	25,000	25,000
Net accounts and notes receivable	11,779,783	10,348,563	13,271,555
Inventories	7,923,526	7,629.265	9,890,962
Deferred charges	390,616	524,133	591,836
Sinking fund	9,861	59.782	959,171
Fixed assets less depreciation	17,969,116	18,590,707	19,178.487
Mining properties less depreciation	14,056,057	13,998,800	13,960,164
Other investments	2,281,978	7,169,710	7,090,854
Goodwill, brands and trademarks	1	1	1
Profit and loss deficit	16,733,009	18,760,660	16,836,525
Total	$76,977,568	$83,855,623	$89,304,261
LIABILITIES—			
Accounts payable and accruals	$ 941.748	$ 1,087.988	$ 1,160.907
Accrued bond interest	409,266	623.484	763,728
Deferred credit	149.518	160,060	303,792
Contingent and federal tax reserve	1,336.211	499.265	507,008
First mortgage bonds	12,363,500	19,707,500	23,209,500
Preferred stock	28,455,200	28.455,200	28.455,200
Common stock	33,322,126	33,322,126	33,322,126
Total	$76,977,568	$83,855,623	$89,304,261

Recent Dividends Announced

American Aggregates Corp. (Init. quar. div.)	75c, Dec. 1
Atlas Portland Cement com. (quar.)	50c, Dec. 1
Cleveland Stone Co. com. (quar.)	50c, Dec. 1
Cleveland Stone Co. com. (extra div.)	25c, Dec. 1
Consolidated Sand & Gravel, Ltd., pfd. (quar.)	1¾%, Nov. 15
Indiana Limestone Co. pfd. (quar.)	1¾%, Dec. 1
International Agricultural Corp. prior pfd. (quar.)	$1.75, Dec. 1
International Agricultural Corp. pfd.	$5, Dec. 1
Lehigh Portland Cement com. (quar.)	62½c, Feb. 1
Lehigh Portland Cement pfd. (quar.)	$1.75, Jan. 1
Penn-Dixie Cement pfd. (quar.)	$1.75 Dec. 15
Superior Portland Cement (quar.)	27½c, Dec. 1
United States Gypsum com. (quar.)	2%, Dec. 31
United States Gypsum pfd. (quar.)	1¾%, Dec. 31

Two Rock Products Stocks in Present Market Stampede

AMONG the industrial stocks traded in New York, which have shown a tendency to follow the present bull market to new levels are International Cement Corp., New York City, quoted in our November 10 issue as of November 5 at 77½, and in this issue as of November 20 at 84⅛ (high). United States Gypsum Co., Chicago, traded on both New York and Chicago exchanges, went to 75 on the Chicago exchange November 20 as compared with 64⅜ on November 7 (our November 10 issue).

Mathieson Alkali Earnings

THE Mathieson Alkali Works (Inc.), which is reported to be planning the construction of a portland cement plant at Saltville, W. Va., reports earnings for the third quarter and the first nine months of 1928:

Period ending September 30—	1928—3 months	—1927	1928—9 months	—1927
Total earnings from operations	$884,213	$778,812	$2,480,125	$2,236,300
Provision for depreciation and depletion	228,866	213,838	682,832	626,533
Net earnings	$655.347	$564,974	$1,797,293	$1,609,767
Income charges net	5,332	12,805	28,297	36,003
Provision for federal income taxes	76,123	72,505	208,975	195,402
Net including transfer to surplus	$573,891	$479,664	$1,560,020	$1,378,363
Earnings per share on 147,207 shares common stock (no par)	$3.60	$2.96	$9.72	$8.48

Portland Cement Association Elects Frank L. Smith President

Intensive Promotion and Protection of American Industry Forecast

"ELECTION of Frank H. Smith, on Wednesday, to the presidency of the Portland Cement Association, which held its annual meeting in Chicago, November 21, will carry far more significance to the national building construction industry in general than would otherwise be conveyed by the announcement that the former New Jersey commissioner of banking and insurance had been chosen head of an international group of building manufacturers," says Allen E. Beals in the current *Dow Service Daily Bulletin Reports,* which continues:

"Portland cement as a commodity in building construction is today comparable, so far as its importance is concerned, to sugar in the grocery trade. It is so great a staple that, like the grocer and his stock of sugar, the building material dealer may stock cement without profit in order that he may sell the cement purchaser the more profitable ingredients that go with it. When such a situation is further complicated by an offer to the dealer of foreign-made portland cement which promises him a margin, coupled with recurrent years of increasing building construction and engineering activity, it is natural for all who manufacture portland cement, whether in the United States, Canada or South America, to speed up production and sale.

"Let a period of industrial, financial or commercial uncertainty intrude itself upon such a situation and at once there arises the question of whether to slow down industry, speed up promotion or make readjustments to fit the emergency. At such times trades have engaged in a free-for-all finger-pointing tournament, vigorously blaming the other for their mutual ills.

"The American portland cement industry finds itself emerging from practically a year of doubt and uncertainty, agreeably surprised, to be sure, that demand for cement has kept up as well as it has, but frankly worried about what is going to be done to stop the stampede in production, at least until the probable post-election prosperity can be gauged.

"The convention of portland cement manufacturers operating throughout the North and South American continents met this year with problems of that magnitude to face. Both interior and exterior readjustment, it is seen, must be made. Above the question of over-production looms that of overseas competition and general promotion of the use of the commodity its membership makes has an equally important place.

"Meantime, the nominating committee was doing its best to find someone for a job that nobody craved. Meantime, the convention date was getting nearer and general trade perplexity deeper, not only in the matter of finding a man qualified to fill the post of president, but one, at the same time, sufficiently trained in the school of applied policy to fit him for the industrial and diplomatic snarls ahead.

"Somebody began looking into the career of Frank H. Smith, president of the Lawrence Portland Cement Co., of Siegfried, Penn., New York, and Thomaston, Me., to find in him not only the president of his company during a long period of gradual expansion and growth, but that his political experience as a member of the New Jersey state Republican committee might, conceivably, stand favorably in the way of piloting the portland cement manufacturing industry of the world's western hemisphere out of the slough of despond and into the ways of increasing prosperity, and that is how the recurrent chairman of the convention's nominating committee came to be the 1928 convention's nominee to succeed G. S. Brown of the Alpha Portland Cement Co., Easton, Penn.

"The remainder of the ticket is: Charles F. Conn, of the Giant Portland Cement Co., for first vice-president, succeeding Col. E. M. Young, of the Lehigh Portland Cement Co.; J. B. John, of the Sandusky Portland Cement Co., for second vice-president, to succeed Robert B. Henderson, of the Pacific Portland Cement Co., and John L. Senior, of the Consolidated Cement Corp., to succeed himself as treasurer.

"Directors for three years are: F. H. Powell, of the Southwestern Portland Cement Co.; G. S. Brown, of the Alpha Portland cement Co.; A. C. Tagge, of the Canada Portland Cement Co.; C. K. Boettcher, of the Colorado Portland Cement Co. and Col. E. M. Young, of the Lehigh Portland Cement Co. Directors for one year: B. F. Affleck, of the Universal Portland Cement Co., to fill the Blaine S. Smith vacancy; Blaine S. Smith, of the Pennsylvania-Dixie Portland Cement Co., to fill the John A. Miller vacancy, and M. J. Warner, of the Nazareth Portland Cement Co., to fill the C. F. Conn vacancy."

Extracts From Address of Retiring President Brown

Estimating 1928 shipments of portland cement will total 175,000,000 bbl., G. S. Brown, retiring president of the Portland Cement Association, declared in his annual address, November 21, that in spite of the reduced rate of increase over 1927, there is no reason to believe the future outlook is affected.

"The reduced rate of increase reflects very definitely such factors as the slump in building awards during the latter half of 1927, which left a correspondingly smaller construction hang-over for 1928," Mr. Brown said. "It does not mean that less new business has been developed during the present year or that the future outlook is affected. On the contrary, it is probable there will be a larger carry-over for next year than was available for shipment in 1928.

"In a number of districts new producing capacity has come in and in all districts we are able to make considerably more of our product than we have been able to sell. Nevertheless, I am of the opinion that those companies whose properties are modern and commercially well located, are well supplied with raw materials and are well financed and managed, have in all districts but one shown satisfactory returns.

"This statement must be modified for those mills which ship largely into sea-coast territory, where low priced foreign cement has forced even the best equipped mills to sell for cost or less," he continued.

Mr. Brown spoke before the 26th annual meeting of the Portland Cement Association, in session at the Blackstone hotel and attended by representatives of manufacturers who produce over 90% of the cement shipped in the United States. The main theme of this address was a review of results of association activity since the war.

"Public confidence in an industry such as ours is largely a question of public understanding," Mr. Brown asserted. "The primary objective of our work has been service to the user. Appreciation on the part of users is unquestionably the greatest factor in the accumulation of public good will.

"Perhaps we are inclined to think too little of the service feature of our association. With the growing use and number of uses of portland cement, users have been seeking information as never before. The association as an information bureau, acting for all the portland cement manufacturers, has handled thousands of inquiries which have enabled inquiriers to use cement in a satisfactory manner."

In this review he cited 290,000,000 bbl. of cement used in road and street paving in the last 10 years and 6,500,000 bbl. used in concrete sewer pipe in the last five years.

At the annual banquet, O. H. Cheney, vice-president, American Exchange Irving Trust Co., New York City, was the only speaker. His address was an exhortation to the men in the cement industry to free themselves from unethical trade practices, which are the cause of demoralization in all industries—more so than over-capacity, which Mr. Cheney said was largely an alibi. The future of the industry lies in an expansion of its association work to meet ever changing conditions, he said.

Monolith Midwest Cement Plant Nearing Completion

CONSTRUCTION of the new $2,000,000 cement mill of the Monolith Portland Midwest Co. at Laramie, Wyo., is being rushed to completion under the personal supervision of W. S. Trueblood, production manager, and other department heads, who have been at the plant site for some weeks directing installation of final equipment.

A crew of 125 men has been kept continuously at work in the construction of the plant for more than a year. Latest reports are that the plant will be ready for opening shortly, starting operations with a capacity of from 1800 to 2200 bbl. of cement daily.

The new cement mill, which was designed and erected by F. L. Smith and Co., cement plant engineers of New York, will have an annual production of between 500,000 and 600,000 bbl. The company owns raw material deposits comprising 2950 acres and valued at more than $5,000,000 in the immediate vicinity of the plant. These deposits are said to be a natural true mixture of the required elements in proper proportions for the manufacture of cement, and in sufficient quantity to supply needs for hundreds of years.

The Midwest company will serve the mid-continent territory, including Wyoming, Colorado, western Kansas, Nebraska, eastern Montana and eastern Idaho. While the Midwest company is a separate corporation, it is managed and controlled by the same men who own, control and operate the Monolith Portland Cement Co. of Los Angeles, Calif.—*Salt Lake City* (Utah) *Tribune.*

Buffalo Packing Plant of Huron Cement Opens

ANOTHER NEW Buffalo industrial plant went into operation November 12 at the port of Buffalo when the steamer *John W. Boardman* arrived at the Huron Portland Cement Co.'s recently completed structure on Buffalo river at the Ohio street bridge. This is one of the six large distributing stations owned by this corporation in the United States; the others are Duluth, Milwaukee, Detroit, Alpena, Mich., and Cleveland.

In addition to these the company operates two manufacturing plants, one at Alpena and one at Wyandotte, Mich. The combined production of these plants is 16,000 bbl. of cement per day. The corporation also handles the output of Henry Ford's plant in the River Rouge, Detroit. The company's total shipping capacity per day during its season of about six or eight months is about 55,000 bbl.

The new Buffalo plant, which took its first cargo on November 12, has a capacity of 125,000 bbl., or 500,000 sacks in all. The new plant has everything in the way of modern equipment, including complete dust collectors, all of which are operated mechanically by the most approved methods.

The building is of reinforced concrete throughout. The cement is packed as ordered and sent from the building in cars, boats or trucks.

The company has three steamers to supply its plants, the *John W. Boardman*, which carries 36,000 bbl.; the steamer *Crapo,* with a capacity of 42,000 bbl., and the *Samuel Mitchell,* 14,000 bbl.

Walter C. Nuhr has been appointed superintendent of the Buffalo plant, and Ray Mooney, district sales manager. P. H. Townsend of Detroit is general superintendent of the company. Others who took part in the opening ceremonies were S. J. Stone, general superintendent for the John W. Cowper Contracting Co., which erected the building, and A. C. Dane, engineer, who designed the plant.—*Buffalo* (N. Y.) *Courier-Express.*

A. C. I. Convention Program Announced

WORD comes from the American Concrete Institute that preparations are already going forward for the institute's 25th annual convention, which will be held in Detroit, the home city of the A.C.I. The convention is to be held at the Book-Cadillac hotel on February 12, 13 and 14 of next year. A local convention committee has already been organized to push the work with George H. Fenkell, general manager and chief engineer of the Detroit Board of Water Supply, as chairman. The vice-chairman is L. E. Williams, engineer for the State Concrete Materials Co., and the secretary is L. G. Lenhardt, engineer in charge of tunnels for the Detroit Board of Water Supply.

The convention will consist of eight technical sessions followed by a dinner on the final evening. The first session, Tuesday afternoon, will be devoted to several papers under the one general theme, "A Condition Survey of Concrete Structures." The second session in the evening of the same day will include several papers descriptive of important uses of concrete in large undertakings in Detroit and vicinity, including a paper on the land tunnel work of the Detroit Board of Water Supply by Mr. Lenhardt, and one by Messrs. Douglass and Nelles of the Detroit Edison Co. on the development of concrete control over a period of years—under the title, "The Economy of Quality in Concrete."

On the second day there will be two concurrent sessions in the afternoon, one devoted to research papers covering a wide range of subjects, and the other for manufacturers of concrete stone and ornamental work to discuss specifications for concrete stone and special problems involved in meeting architectural requirements in that growing branch of the industry. The program for this session, promising some contributions of livliest practical interest and importance, is being developed with the active co-operation of the Institute Committee P-3, Concrete Stone. Again in the evening there will be two concurrent sessions, one for those interested in the manufacture of standard concrete building units, block brick and tile; another, for the consideration of the theme, "The Development of Reinforced Concrete Specifications in the Last Decade." This session will include a further consideration of the joint standard building code, tentatively adopted by the institute last winter.

Both morning and afternoon of the third convention day, Thursday, there will be a symposium of about 10 papers from as many authorities on concrete, setting forth the special characteristics required in concrete to meet different uses and exposures.

Four-Lane Highway Across Continent Proposed

SENATOR DU PONT (Maryland) recently introduced a bill in the Senate calling for the construction of a transcontinental highway, permitting two-way fast traffic for tourist and non-truck traffic, and two-way slow traffic for trucks and other heavy traffic, with an initial appropriation of $5,000,000. [Bill No. S-1900, awaiting action of the Senate at the forthcoming December session.] The bill was reported to the Senate by the Committee on Post Offices and Post Roads in the closing month of the last session. [Senate Report No. 999, 70th Congress.]

Summarizing the purpose of the measure, Warren Martin, speaking on behalf of Senator duPont, stated that the bill would establish a commission who would be instructed to make a preliminary examination and survey for a central highway as direct as practicable from the Atlantic to the Pacific Coast, and to study the practicability of a highway along the Pacific seaboard, another along the southern boundary, another along the Atlantic seaboard, and another from a point on the central highway as near longitude 95 degrees as may be practicable south to connect with the southern boundary highway. For financing it was proposed that the government take a strip 500 ft. wide, assuming that for the time at least 100 ft. would be used, the balance of the strip to be leased to the businesses that would spring up along a highway of this magnitude, such as has been the case with other arterial projects.

Portland Cement Production in October

Shipments 9.6% Above Those of October, 1927—Year's Production to End of October 3,000,000 Bbl. More Than Same Period in 1927

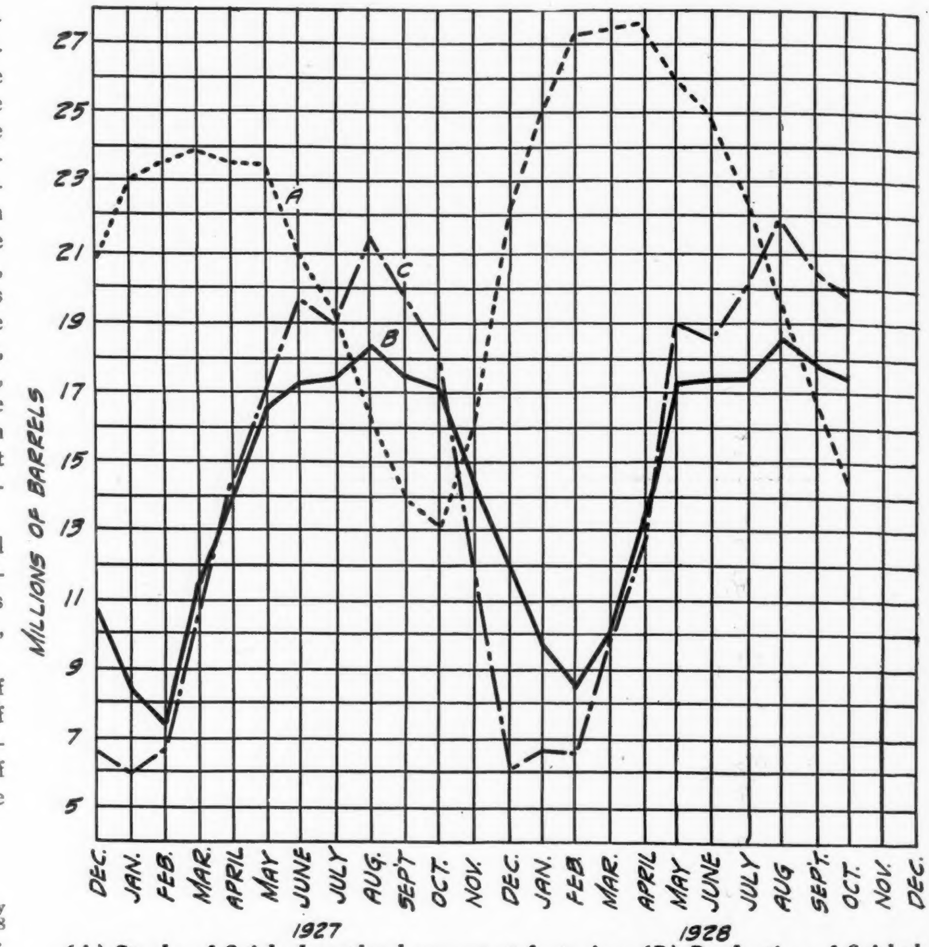
THE PORTLAND CEMENT INDUSTRY in October, 1928, produced 17,533,000 bbl., shipped 19,836,000 bbl. from the mills, and had in stock at the end of the month 14,495,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in October, 1928, showed an increase of 2.1% and shipments an increase of 9.6 per cent as compared with October, 1927. Portland cement stocks at the mills were 10.3% higher than a year ago. The total production from January to October, 1928, inclusive, amounts to 148,569,000 bbl., compared with 145,460,000 bbl. in the same period of 1927, and the total shipments from January to October, 1928, inclusive, amount to 156,120,000 bbl., compared with 153,103,000 bbl. in the same period of 1927.

The statistics here presented are compiled from reports for October from all manufacturing plants except two for which estimates have been included in lieu of actual returns, as no returns were received from them.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 159 plants at the close of October, 1928, and of 154 plants at the close of October, 1927.

RELATION OF PRODUCTION TO CAPACITY

	Oct. 1928 Pct.	Oct. 1927 Pct.	Sept. 1928 Pct.	Aug. 1928 Pct.	July 1928 Pct.
The month	87.1	87.4	91.7	93.1	87.0
12 months ended	73.8	73.6	73.7	73.5	73.7



(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories

PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, IN 1927 AND 1928 (IN BARRELS)

Month	1927—Production	1928	Stocks at end of month 1927	1928
January	10,410,000	11,839,000	9,989,000	9,672,000
February	9,253,000	11,363,000	11,943,000	12,237,000
March	12,397,000	12,501,000	12,997,000	14,463,000
April	14,246,000	13,844,000	13,335,000	15,002,000
May	15,677,000	16,025,000	12,514,000	14,329,000
June	15,437,000	15,940,000	10,926,000	12,944,000
July	15,697,000	15,981,000	9,609,000	11,707,000
August	16,396,000	16,202,000	7,887,000	9,357,000
September	15,931,000	15,909,000	6,490,000	*7,566,000
October	16,469,000	15,782,000	5,960,000	5,975,000
November	14,698,000	....	6,374,000	....
December	13,177,000	....	7,660,000	....

*Revised. †Maine began producing in April, 1928, and shipping in May, 1928.

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN AUGUST AND SEPTEMBER, 1927 AND 1928, IN BARRELS*

Shipped to	1927—August	1928	1927—September	1928
Alabama	243,841	315,341	229,592	255,120
Alaska	338	382	742	277
Arizona	34,598	57,033	38,589	56,940
Arkansas	85,164	150,173	87,996	136,794
California	1,158,661	1,166,958	1,114,333	1,020,406
Colorado	124.628	147,267	107,896	140,150
Connecticut	239,392	279,631	257,188	233,257
Delaware	40,815	29,447	58,667	34,578
District of Columbia	103,217	83,553	100,626	81,703
Florida	180,328	105,108	152,129	98,859
Georgia	193,713	181,254	149,740	155,421
Hawaii	28,219	25,413	11,790	21,378
Idaho	30,000	45,284	29,588	30,886
Illinois	2,066,172	2,581,921	1,902,780	2,553,958
Indiana	868.669	804.868	807,523	847,440
Iowa	602,653	813,328	563,779	738,450
Kansas	251,022	233,127	261,769	272,461
Kentucky	283,184	216,674	245,577	211,690
Louisiana	147,709	125,319	129,457	112,202
Maine	81,018	71,721	63,493	79,289
Maryland	366,046	260,189	285,248	227,573
Massachusetts	314,527	308.837	310.562	315,939
Michigan	1,788,820	1,707,324	1,459,078	1,692.432
Minnesota	480.599	401,260	414.197	377.096
Mississippi	111,007	122.486	92.276	129.970
Missouri	560,364	541,927	489,155	554,767
Montana	50,776	66,954	43,797	59,124
Nebraska	180,063	127.833	195.109	159,659
Nevada	6.149	14.101	4.845	13.635
New Hampshire	56,223	69,903	66.537	72.947
New Jersey	853,588	878,977	960,390	884,759
New Mexico	23,750	43,079	23,103	27,552
New York	2,749,722	2,774,981	2,703,962	2,398,193
North Carolina	340,093	218,950	303,283	167,910
North Dakota	69,872	61,931	35,938	43,739
Ohio	1,381,581	1,549,784	1,406,311	1,410,196
Oklahoma	298,452	286,023	329,676	361,360
Oregon	188,586	175,733	127,909	132,521
Pennsylvania	1,706,430	1,699,137	1,683,405	1,519,073
Porto Rico	3,500	....	....	500
Rhode Island	85,312	71,291	76.597	77,316
South Carolina	103,455	152,387	100,262	108,575
South Dakota	50,994	62,440	56,882	58,274
Tennessee	285,835	323.794	253,945	353,282
Texas	533,591	690,901	449.994	515,419
Utah	60,332	65,376	43,021	49,468
Vermont	67,255	103.293	71,529	108,095
Virginia	211,679	214,602	197,320	173,104
Washington	335,681	408,566	264.748	291,994
West Virginia	239,578	166,289	250,542	166,816
Wisconsin	1,035,131	809.545	711.004	791,171
Wyoming	22.131	30,976	19.223	27,555
Unspecified	23,887	30,779	38,980	41,593
	21,348,350	21,873,450	19,782,082	20,392.866
Foreign countries	62,650	96,550	45,918	67,134
Total shipped from cement plants	21,411,000	21,970,000	19,828,000	20,460,000

*Includes estimated distribution of shipments from three plants each month.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN OCTOBER, 1927 AND 1928, AND STOCKS IN SEPTEMBER, 1928 (IN BARRELS)

District	Production 1927—October	Production October—1928	Shipments 1927—October	Shipments October—1928	Stocks at end of month 1927—October	Stocks at end of month October—1928	Stocks at end of Sept., 1928*
Eastern Penn., N. J. & Md.	3,799,000	3,743,000	3,924,000	4,753,000	3,389,000	3,976,000	4,987,000
New York and Maine†	1,143,000	1,204,000	1,171,000	1,375,000	1,142,000	1,102,000	1,273,000
Ohio, West'n Penn., W. Va.	1,746,000	2,120,000	1,964,000	2,294,000	1,513,000	1,985,000	2,159,000
Michigan	1,557,000	1,550,000	1,560,000	1,673,000	1,077,000	757,000	879,000
Wis., Ill., Ind. and Ky.	2,280,000	2,238,000	2,579,000	2,646,000	885,000	876,000	1,283,000
Va., Tenn., Ala., Ga., Fla. and La.	1,567,000	1,561,000	1,505,000	1,576,000	1,178,000	1,619,000	1,634,000
East'n Mo., Ia., Minn., S.D.	1,572,000	1,599,000	1,811,000	1,705,000	991,000	1,466,000	1,572,000
West'n Mo., Neb., Kan. and Okla.	1,109,000	1,190,000	1,208,000	1,361,000	1,213,000	992,000	1,164,000
Texas	532,000	617,000	535,000	552,000	270,000	346,000	281,000
Colo., Mont. and Utah	187,000	199,000	258,000	282,000	313,000	304,000	387,000
California	1,388,000	1,177,000	1,268,000	1,257,000	824,000	687,000	768,000
Oregon and Washington	294,000	335,000	322,000	362,000	346,000	385,000	412,000
	17,174,000	17,533,000	18,105,000	19,836,000	13,141,000	14,495,000	16,799,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1927 AND 1928 (IN BARRELS)

Month	1927—Production	Production—1928	1927—Shipments	Shipments—1928	Stocks at end of month 1927	Stocks at end of month 1928
January	8,258,000	9,768,000	5,968,000	6,541,000	22,914,000	25,116,000
February	7,377,000	8,797,000	6,731,000	6,563,000	23,563,000	27,349,000
March	11,450,000	10,223,000	11,100,000	10,135,000	23,922,000	27,445,000
April	14,048,000	13,468,000	14,350,000	13,307,000	23,654,000	27,627,000
May	16,701,000	17,280,000	16,865,000	18,986,000	23,503,000	25,984,000
June	17,224,000	17,469,000	19,761,000	18,421,000	20,972,000	25,029,000
July	17,408,000	17,445,000	18,984,000	19,901,000	19,397,000	22,580,000
August	18,315,000	18,730,000	21,411,000	21,970,000	16,292,000	*19,374,000
September	17,505,000	17,856,000	19,828,000	*20,460,000	13,996,000	*16,799,000
October	17,174,000	17,533,000	18,105,000	19,836,000	13,141,000	14,495,000
November	14,449,000	....	11,619,000	....	16,022,000	....
December	11,999,000	....	6,200,000	....	22,082,000	....
	171,908,000	....	170,922,000	....	....	....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN OCTOBER, 1927 AND 1928 (IN BARRELS)

District	1927—Production	Production—1928	Stocks at end of month 1927	Stocks at end of month 1928
Eastern Pennsylvania, New Jersey and Maryland	3,744,000	3,265,000	766,000	867,000
New York and Maine†	1,128,000	1,103,000	281,000	627,000
Ohio, Western Pennsylvania and West Virginia	1,697,000	1,856,000	634,000	529,000
Michigan	1,357,000	1,303,000	440,000	527,000
Wisconsin, Illinois, Indiana and Kentucky	2,164,000	2,122,000	281,000	216,000
Virginia, Tenn., Ala., Ga., Fla. and La.	1,516,000	1,445,000	691,000	720,000
Eastern Missouri, Iowa., Minnesota and So. Dak.	1,537,000	1,444,000	408,000	292,000
Western Missouri, Nebraska, Kansas and Oklahoma	1,064,000	1,089,000	231,000	303,000
Texas	535,000	570,000	179,000	112,000
Colorado, Montana and Utah	145,000	222,000	454,000	315,000
California	1,276,000	1,089,000	1,242,000	1,188,000
Oregon and Washington	306,000	274,000	353,000	279,000
	16,469,000	15,782,000	5,960,000	5,975,000

Exports and Imports

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN SEPTEMBER, 1928

Exported to	Barrels	Value
Canada	3,787	$19,204
Central America	15,300	36,316
Cuba	4,500	13,168
Other West Indies and Bermuda	2,005	6,791
Mexico	5,423	17,904
South America	34,860	123,141
Other countries	6,120	36,319
	71,995	$252,843

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES, AND BY DISTRICTS, IN SEPTEMBER, 1928

Imported from	District into which imported	Barrels	Value
Belgium	Florida	20,300	$ 25,516
	Galveston	18,567	23,632
	Los Angeles	500	598
	Massachusetts	33,243	45.136
	New York	8,717	9,195
	Oregon	5,200	6,516
	South Carolina	47,310	57,001
	Virginia	600	664
	Washington	9,800	12,792
	Total	144,237	$181,050
Canada	Maine & N. H.	4,500	$ 10,848
	San Francisco	2	6
	Total	4,502	$ 10,854
Denmark	Porto Rico	2,000	$ 2.528
France	New York	691	$ 1,444
Germany	New York	1.000	$ 2,450
Norway	Philadelphia	7,069	$ 8,006
United K'd'm	Galveston	12,000	$ 15,785
	Los Angeles	300	625
	New York	1,340	2.927
	San Francisco	300	626
	Total	13,940	$ 19.963
	Grand total	173,439	$226.295

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII, AND PORTO RICO, IN SEPTEMBER, 1928

	Barrels	Value
Alaska	290	$ 874
Hawaii	27,169	63,916
Porto Rico	2,281	5,518
	29,740	$70,308

Prepared under supervision of Frank J. Katz, Chief, Division of Mineral Statistics.

World-Wide Portland Cement Cartel Planned

A PARIS CABLE to the *Wall Street News* (New York City) says negotiations for a world-wide cement trust are now under way. Limited agreements for the division of markets already exist in Germany, Poland and Switzerland and between France and Belgium. Austrian and Hungarian cement manufacturers recently reached an accord for the same purpose. It is now planned to bring all the cement-producing countries together in a world understanding. The American cement industry, it is said, has been approached with a view to its participation in the projected entente, which, in the opinion of business circles in Paris, would do much to relieve the present depressed character of the cement market.

Japanese Cement Industry Adopts Waste-Heat Power Extensively

AT THE RECENT WORLD power conference in London, England, Dr. Kasai read a paper, "Waste Heat Recovery in the Japanese Cement Industry." The two main methods of waste heat recovery, namely, preheating of combustion gas or air and steam raising, were dealt with. In processes using high calorific fuel gas, the air required for combustion is insufficient to take up the bulk of the heat in the "waste" gases, but with a low calorific heating gas only about one-half of the heat can be absorbed by the air, the remainder being available for steam raising. Attention is called to the fact that even in this latter case it is often assumed that because a low outlet temperature, say, of 300 deg. C., is registered, no further heat can be recovered. It is stated that invariably in such cases the low temperature is due to air infiltration, and it is interesting to note that Dr. Kasai has found that preventing air infiltration by encasing the ends of the cement kilns has permitted further heat recovery to be attained. In the detailed consideration of the preheating of air by recuperators mention is made of metal recuperators. For low temperature work they have been largely adopted, but while various special metals have been discovered which will withstand high temperatures, they have a high initial cost for recuperator work, and, unfortunately, in general, deteriorate rapidly when in contact with "waste" gases containing sulphur compounds. Nevertheless there is no question that there is considerable need for a metal recuperator which will withstand the effect of high temperature sulphur-containing "waste" gases.

According to Dr. Kasai, the Japanese cement manufacturers have adopted the use of waste heat boilers to a very considerable degree. In 18 of the 30 cement works in Japan, representing 80% of the total production the normal output of electricity from "waste" heat steam is 54,100 kw., equivalent to a saving of 500,000 metric tons of coal per year (about 550,000 American tons).

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1927 AND 1928

Month	1927—Exports Barrels	1927 Value	Exports—1928 Barrels	1928 Value	1927—Imports Barrels	1927 Value	Imports—1928 Barrels	1928 Value
January	75,346	$254,072	56,400	$204,875	193,175	$269,661	234,753	$342,797
February	71,404	233,985	62,828	221,620	130,421	200,680	164.408	217,525
March	67,956	240,165	74,983	265,719	181,145	261,519	235,930	330,074
April	72,383	243,832	61,676	205,882	192,318	313,262	249,458	324,371
May	59,332	205,574	70,173	236,005	178,929	263,618	190,509	256,872
June	69,205	237,281	59,536	201,313	129,111	201,682	266.537	359,637
July	72,337	249,737	83,759	291,055	175,042	249,665	112,887	151,877
August	61.371	209,198	88.736	302,866	117,605	170,167	259.988	358,858
September	57,890	207,817	71,995	252,843	233,066	304,796	173,439	226,295
October	67,639	230,668	....	....	221,274	321,777	....	....
November	79,764	257,428	....	....	141,485	190,419	....	....
December	62,099	226,960	....	....	156,609	209,205	....	....
	816,726	$2,796,717	....	....	2,050,180	$2,956,451	....	....

Foreign Abstracts and Patent Review

Permeability of Concrete to Water. The German Concrete Association has gathered data on the permeability of concrete by distributing a circular letter on February 16, 1928, and presents the results of the use of various proportions of water, cement, and aggregates of various sizes and kinds in the mortar upon the permeability to water.—*Beton und Eisen* (1928), **27**, 13, p. 261.

Concerning the Silicic Acids. Prof. Dr. R. Schwarz summarizes his investigations of the silicic acids in this that SiO_2 can form at least two hydrates, the meta-acid ($SiO_2 \cdot H_2O$) and the di-acid ($2SiO_2 \cdot H_2O$), which are both at least hexametric. The di-acid forms in the direct disintegration of the corresponding alkali-silicate in crystalline condition; in amorphous shape it appears in the silicic-acid gels which are formed by the hydrolysis of watery alkali-silicate solutions. The meta-acid forms in the surface-chemical decomposition of the sodium meta-silicate and is furthermore found also in those gels which are formed in the hydrolysis of silicium combinations in the cold such as $SiFe_4$ or $SiCl_4$. In the alkali-silicate solutions the clays SiO_3 and Si_2O_5 are found in an equilibrium, which is shifted with increasing hydrogen-ion concentration in favor of Si_2O_3.—*Zement* No. 24 (1928), pp. 930-933.

New Regulation Standards for Hydraulic Binders. In accordance with the new (Italian) standards (decree of September 4, 1927), cements are grouped into the following classes: (1) Hydraulic lime; (2) high hydraulic lime; (3) rapid setting cement; (4) slow setting cement. The regulations contain exact directions for conducting the tests to be made, the delivery requirements and the precautions for control in the manufacture of cement. The following limit values were determined:

Class	Maximum screen (900) 75-mesh	Residue (4900) 125-mesh	Minimum specific gravity	Setting period in hours. Start	End	Minimum Strength† Tensile, Days 7	Tensile 28	Compressive 7	Compressive 28
Hydraulic lime	7	25	2.70	2-6	8-48				
High hydraulic lime	7	25	2.70	2-6	8-48	......	71.1	....	28.4
Rapid setting cement	15	....	2.80	1-60	1-2	......	113.8	....	711.2
Slow setting cement						*170.7	......	*1706.8	....
1. Quality	2	20	2.90	1	6-12	284.5	355.6	3555.9	5689.4
2. Quality	2	20	2.80	1	6-12	256.0	312.9	2560.2	3982.6

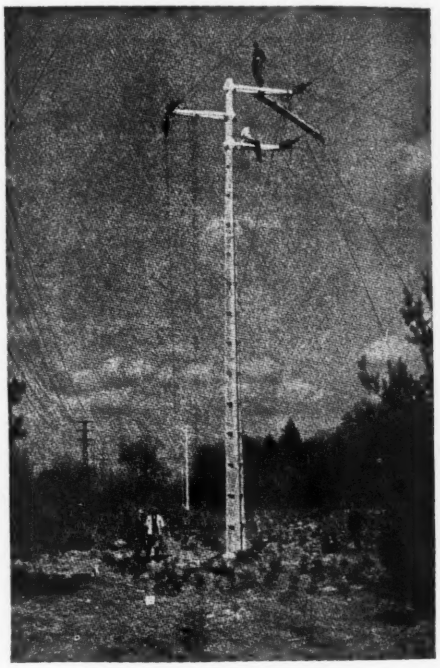
*Which are on standard mixes. †All on standard mortars except those marked.

—*Le Industrie del Cemento,* (1928) **25**, pp. 14-18.

New Acid-Proof Concrete "Prodorite." This new product on exhibit at the recent fair in Basle, Switzerland, is obtained by adding a special organic binder under use of coarse and fine stone materials, and the mortar is prepared hot with special machinery. The product has the good characteristics of concrete, is entirely waterproof and resists hydrochloric acids of any concentration and temperature and other aggressive acids including sulphuric, nitric, formic, acetic, and lactic acids, and also alkalies, as well as cold and hot ammonia, lime and gypsum solutions, chlorine lyes, and such aggressive chemicals as zinc chloride, bisulphate, hypochloride, salmiac and ammonia nitrate. Its compressive strength is 8534 lb. per sq. in., its flexural strength up to 1422 lb. and its adhesive strength to iron 953 lb. per sq. in. Statically loaded "Prodorite" may not be exposed to temperatures above 176 deg. F., but pipes in gas lines can resist temperatures from condensation to 284 deg. F. gas temperature. "Prodorite" is also suitable for flooring, roofing and sidewalks.—*Zement* (1928) 17, 25, p. 989.

The Cement and Lime Industry in the Province Alessandria in Italy. The extent of the cement and lime industry in this province in which about one-sixth Italian cement industry is concentrated is evident from the following data, and it should be noted that natural cements are concerned primarily: In 1927 the quarries produced 750,000 tons of lime marl, mining was done in 130,315 running feet of tunnels and 1877 laborers were employed in these quarries. Cement production amounted to 585,000 tons in 1925, 575,000 tons in 1926 and 570,000 tons in 1927, bringing average prices per 100 kg. (220 lb.) of 22.30 lire in 1925, 20.00 lire in 1926 and 14.30 lire in 1927. The production of stucco lime amounted to 45,000 tons in 1927, yielding 13.50 lire per 100 kg. The cement, and lime, was produced in 1927 in 132 Dietzch kilns, 3 automatic shaft kilns, 2 rotary kilns and 28 lime kilns, using a total of 100,000 tons of coal, employing 1836 laborers and requiring energy in horsepower as follows: electric, 5535; steam, 100; water, 100, and gas and oil, 300. The wages in 1926 and 1927 amounted to 27,290,000 lire. Recently two other plants have installed rotary kilns.—*Tonindustrie-Zeitung* No. 64 (1928), pp. 1301-1302.

Steel-Concrete Transmission Towers for Public Service Companies. A well-known large German public service company which had about 50,000 wooden transmission towers in service was forced to replace about 5000 of them every year due to rotting of the wood. If steel electric transmission towers had been used, they would have had to be recoated every 3 to 4 years to protect them from corrosion, etc. The concrete transmission tower, on the other hand, has the advantage that no replacement or repair is necessary. The Kisse steel-concrete transmission tower, for which patent was applied for in the year 1921, is made in the factory of Gebr. Rank near Emmering and Fuerstenfeldbruck. With the Kisse process the spans between the towers are greater than those between the wood towers. For a span of



Precast electric transmission towers

100 m. the Kisse tower is only slightly more expensive, figured per kilometer, than the wooden tower with a span of 50 m. The core of the Kisse tower is a three-section ribbing, each consisting of 3 or 4 steel rods which are tied with spirals. This framework is then poured with concrete in a form up to 35 m. long, a carefully sized gravel and a high-grade cement being used. The tightly-closing iron forms in which the steel frame of the tower has been placed is pounded continually by a large number of hammers, or vibrators, while the concrete is being poured. Due to the rapid vibrations of the iron forms, a greater proportion of cement accumulates near the rim than in the interior, thus making the concrete towers waterproof. The Kisse towers may be transported and erected three days after pouring. They have easy accessibility, smooth and attractive appearance, and they are used by nearly all large public service companies in southern Germany and to a wide extent in central Germany.—*Tonindustrie-Zeitung,* **52,** 39, pp. 789-790, 1928.

Philadelphia "Cement War" Is Ended

THE PAYMENT of $140,000 to the Union Paving Co., Philadelphia, Penn., held up by the city controller's office pending the outcome of objections brought by the Cement Information Bureau, was approved November 7, after all opposition was withdrawn by the bureau.

An agreement between the cement manufacturers and the Bureau of Highways as to the future specifications for cement was announced by Morris Wolf, attorney for the group, shortly before the time for the public hearing on the charges, which had been scheduled to be held on the same day.

The charges were brought by the cement manufacturers as the result of work recently finished on Market street, for which it was said that a foreign product had been favored in letting the contracts. The public hearing had been arranged by Deputy Controller Wilson, in an effort to have all the facts in the case presented before definite action was taken.

The letter from Mr. Wolf was as follows:

"On behalf of the Cement Information Bureau I beg to inform you that as the result of our conference with the Bureau of Highways a satisfactory programme had been agreed upon relative to the future specifications for cement. We are therefore glad on behalf of the bureau to be able to withdraw the objection which we have made previously to the payment of bills for paving work done under contracts which included the specifications for fast-hardening cement previously objected to. This includes specifically the work done by the Union Paving Company on Market street." —*Philadelphia* (Penn.) *Inquirer*.

Canadian Sand and Gravel Producer Enters Cleveland, Ohio, Market

ACQUIREMENT by lease of two parcels of land on the lakefront from the north edge of Whiskey Island by Mapes and Ferdon, Ltd., of Montreal, Que., was reported at Cleveland, Ohio, recently. The company, which is one of the largest operating out of Montreal in the sand, gravel and shipping business, is reported to be planning on the building of several slips and docks on the property which has just been taken over. It is understood, too, that in addition to these facilities for the handling of sand, gravel and crushed rock, a large refrigerating warehouse will be erected at an early date. It is said plans are practically completed by the company to start immediately on two or three slips and docks which will cost nearly half a million dollars.

One of the parcels included in the transaction was taken from the Scofield Land Co. and is a part of the old Lake Erie Iron Co. It is comprised of nearly nine acres of land together with riparian rights extending into the lake inside the breakwater. This lease is taken on the basis of $12,000 annual rental for the first two years, $18,000 a year for third year, $24,000 a year for the remaining seven years. Option clauses are contained in the lease, based on a rental of $33,000 a year for the next five years, and $35,000 a year for the remaining five years. Purchase options call for a fixed valuation of $550,000 if exercised within the first three years, $575,000 for the next seven years, and $600,000 thereafter.

The second parcel includes six and one-half acres which is held by the Erie railroad, lying just west of the river and is accessible to two railroad switch lines, the Pennsylvania and the New York Central. The lake frontage extends a distance of 740 ft. which is available for dock purposes. This, too, includes riparian rights inside the breakwater eastward as far as the Pennsylvania docks.

Another phase of the transaction which was announced is that negotiations are pending with M. F. Bramley, looking to a lease for a part of the equipment when built. Mr. Bramley is reported to be looking to the use of the docks and storage space in connection with the United Supplies Co. and the paving business in which he is interested.—*Cleveland* (Ohio) *News*.

W. H. Teare, Limestone Dealer, Dies on Cleveland Street

HIS HEAD CRUSHED and the bones broken as though they had been run over by a heavy truck, William H. Teare, president of the Teare Limestone Co., Cleveland, Ohio, was discovered dead November 9 at Superior avenue, N. W., and West Sixth street, Cleveland.

Although traffic was heavy at that hour, few witnesses to the tragedy could be found and their stories were contradictory. Two said Mr. Teare was standing in the safety zone at the northeast corner of the intersection and collapsed, falling backward into the stream of speedying westbound traffic. Others said he was struck by an automobile as he walked from the curb to the zone.

The nature of the injuries to the victim's head incline police to the belief he collapsed and fell into the path of an automobile.

Mr. Teare was 50. He was born on the Isle of Man and came to Cleveland nearly 30 years ago to start his career as a grocery clerk.

Fifteen years ago he organized the Teare Limestone Co. with offices in the Perry-Payne building, dealing in agricultural limestone screenings.

He is survived by a widow, Lillian; a daughter, Mary; two brothers, J. Ernest Teare; Thomas, of Moosejaw, Alta, Canada, and three sisters, Mrs. J. R. Cull, wife of the Toledo safety director; Mrs. Emily Cowell and Miss Eleanore Teare, Isle of Man.—*Cleveland* (Ohio) *Plain Dealer*.

New Quarry for Chicago Metropolitan Territory

EIGHTY ACRES of land on West 47th street, west of Lawndale road and north of the Joliet road, being south of and adjoining the town of Lyons, Ill., have been purchased by the Material Service Co., Chicago, for use as a quarry. Henry Crown is president of the company. The purchaser's investment will be $500,000, it is stated. The firm now operates a quarry at La Grange. Its new quarry is served by the Atchison, Topeka and Santa Fe and by the Chicago and Illinois Western railways. However, most of its material will be delivered by truck.—*Chicago* (Ill.) *Tribune*.

C. H. Chubb to Manage Penn.-Dixie Service Bureau

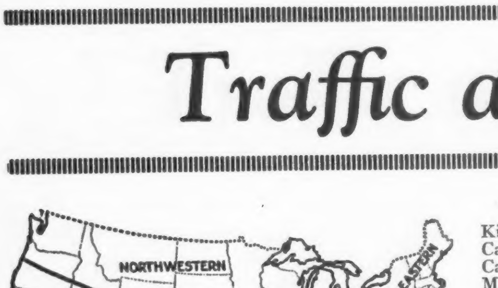
J. H. CHUBB has been appointed manager of the service bureau of the Pennsylvania-Dixie Corp., with headquarters in the New York office of the company. He is a graduate civil engineer and has had over 20 years' experience observing the results obtained with and advising concerning the proper use of portland cement and concrete in all classes of construction work. He is a member of the Western Society of Engineers, American Concrete Institute and American Society for Testing Materials. For many years he has been a member of the committee on technical problems, Portland Cement Association, which outlines the tests and activities and reviews publications of the association's research laboratory.

Mr. Chubb has been instrumental in promulgating the idea of concrete mixes that would produce with standard portland cement, concrete having a 3-day strength as great as that of ordinary concrete at 28 days. Satisfactory results in many diversified concrete jobs have proven it to be sound in every respect and made it possible to place concrete work in service in as many days as it formerly took weeks. He is the author of a number of booklets covering the proper use of concrete and has also prepared articles that have appeared in the technical press.

Joseph A. E. Hoeveler

JOSEPH A. E. HOEVELER, 47, formerly vice-president of the Iron City Sand and Gravel Co., a lifelong resident of Pittsburgh, Penn., died October 31. Mr. Hoeveler, who was the Pittsburgh sales manager for the Ready Mixed Concrete Co., was born in Pittsburgh, the son of Joseph A. E. Hoeveler. He was associated with the Iron City Sand and Gravel Co. 16 years. He leaves a widow, Mary Elizabeth S. Hoeveler; a son, Joseph A. E. Hoeveler, Jr.; two daughters, Dorothy and Jean Hoeveler; two brothers, Harold and Marceline Hoeveler, and a sister, Miss Nellie Hoeveler.—*Pittsburgh* (Penn.) *Post-Gazette*.

Traffic and Transportation



Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

	Limestone Flux Week ended		Sand, Stone and Gravel Week ended	
District	Oct. 20	Oct. 27	Oct. 20	Oct. 27
Eastern	3,298	3,162	16,786	14,535
Allegheny	4,073	3,901	10,860	9,627
Pocahontas	492	457	981	786
Southern	513	617	11,248	11,839
Northwestern	1,242	1,476	7,625	6,640
Central Western	418	522	11,021	10,392
Southwestern	318	424	7,676	8,271
Total	10,354	10,559	66,197	62,090

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1927 AND 1928

	Limestone Flux Period to Date		Sand, Gravel and Stone Period to Date	
	1927	1928	1927	1928
District	Oct. 29	Oct. 27	Oct. 29	Oct. 27
Eastern	145.695	129,092	482.721	489.187
Allegheny	153,610	148,479	368,595	326,482
Pocahontas	22.113	20.193	42.192	35.396
Southern	25,313	25,210	525,628	457,504
Northwestern	57,902	57.608	315.080	290,421
Central Western	21.723	19,134	415.262	444.853
Southwestern	15,079	17,778	249,625	271,738
Total	441,435	417,494	2,399,103	2,315,581

COMPARATIVE TOTAL LOADINGS, 1927 AND 1928

	1927	***1928***
Limestone flux	***441,435***	***417,494***
Sand, stone, gravel	***2,399,103***	***2,315,581***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning November 17:

CENTRAL FREIGHT ASSOCIATION DOCKET

19975. To amend Item 55 of C. F. A. T. B. Tariff 221A to provide for nonapplication of class rates on **crushed stone**, carloads, Linwood, Buffalo, Davenport, Bettendorf, Ia., and Moline, Ill., to all points of destination as named in the tariff, allowing to apply in lieu thereof lowest combination.

19978. To establish on **stone dust**, carloads, Piqua, O., to Bellefontaine, O., rate of 92c per net ton. Present rate, 140c per net ton.

19979. To establish on **crushed stone**, carloads, Holland, O., to Ottawa Lake, Mich., rate of 65c per net ton. Present rate, 75c per net ton.

19980. To establish on **sand and gravel**, carloads, Randles to Coshocton, O., to Ohio, rates as shown below:

To	Prop.	Pres.	Prop.	Pres.
Killbuck, O.	(1) 65	(2) 11½	....	....
Cambridge, O.	(1) 85	(2) 9½	(1) 85	(3) 90
Caldwell, O.	(1) 95	(2) 13½	(1) 95	(3) 100
Marietta, O.	(1) 105	(2) 15	(1) 105	(3) 110

(1) Rates in cents per ton of 2000 lb.
(2) Rates in cents per 100 lb. (sixth class).
(3) Rates in cents per ton of 2000 lb.

19981. To establish on **crushed stone, gravel, sand and slag**, carloads, from Joliet and Plainfield, Ill., to point in Indiana, rates as shown below, in cents per 2000 lb.

To	Pres.	Prop.
Lakeville, Ind.	115	105
Wyatt, Ind.	120	110
Wakarusa, Ind.	120	110

Route—Via E. J. & E. Ry., Crocker, Ind., and Wabash Ry.

19993. To establish on **sand** (except blast, core, engine, filter, glass or furnace, foundry, glass, grinding or polishing loam, molding or silica) and **gravel**, carloads, Jamestown, Penn., to Oil City, Penn., rate of 100c per net ton. Route via N. Y. C. R. R., Franklin, Penn., and Erie R. R. Present rate, via N. Y. C. direct, 80c per net ton; via N. Y. C. and Erie, sixth class.

19996. To establish on **crushed stone**, carloads, Whitehouse, O., to points in Ohio, rates as shown below, in cents per net ton:

To	Pres.	Prop.	To	Pres.	Prop.
Denson	90	**70**	Gallup	80	70
Oak Shade	80	**70**	Prentis	80	70
Ottokee	80	**70**	Leipsic	90	70
Naomi	80	**70**	Ottawa	90	70
Gerald	80	**70**	Columb's Gr've	90	70
Malinta	80	**70**	Cairo		70
Hamler	80	**70**			

Route: Wabash, Napoleon, O., D. T. & I.

19997. To establish on **sand** (all kinds) and **gravel**, carloads, Krumroy, O., to Akron, O., rate of 45c per net ton, B. & O. delivery only, and 50c per net ton when consigned to industries on connecting lines within switching limits. Present rate, 60c per net ton.

19998. To establish on **sand, blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica**, carloads, from Kennerdell, Penn., to points in Pennsylvania, rates as shown below:

To	Pres. rate (6th class)	Prop. rate Per net ton
Carnegie, Penn.	14c	180c
Bridgeville, Penn.	14c	180c
Washington, Penn.	15c	189c

20032. To establish following rule in connection with rates on **sand**, carloads, between points in C. F. A. territory:

"Where the shipper requests a low capacity car and the carrier is unable to furnish a car of such capacity within the period of four days from the receipt of such request, then the carrier may furnish a car of larger capacity, and the freight to be charged on such car shall be based upon the actual net weight of the contents, but in no event less than 90% of the marked capacity of the car requested by the shipper."

20042. To establish on **crushed stone**, in bulk, in open cars, carloads, Middlepoint, O., to Akron and Barberton, O., via Penn. R. R., rate of 100c per net ton. Present rate, 90c per net ton.

20043. To establish on **crushed stone**, carloads, East Liberty, O., to Celina, Ft. Recovery and Coldwater, O., via N. Y. C., St. Marys, N. Y. C. & St. L., rate of 70c per net ton. Present rate, sixth class.

20045. To establish on **ground or pulverized limestone**, carloads, Piqua, O., to Mason City, Ill., via C. & A. R. R., rate of 290c per net ton. Present rate, 360c per net ton.

20047. To establish on **crushed stone**, carloads, Holland, O., to Rochester, Mich., rate of 107c per net ton. Present rate, sixth class. Route via N. Y. C. R. R.-M. C. R. R.

20050. To establish on **crushed stone**, carloads, East Liberty, O., to Circleville, O., rate of 95c per net ton. Present rate, sixth class.

20053. To establish on **crushed stone, gravel, sand and slag**, carloads, Joliet and Plainfield, Ill., to Merrillville, Beatrice and Malden, Ind., rate of 77c per net ton. Present rates—To Merrillville and Beatrice, Ind., 92c, and to Malden, Ind., 95c per net ton, except on slag present rate is 80c to Merrillville and 90 per net ton to Beatrice and Malden, Ind. Route via E. J. & E. Ry., Griffith, Ind., C. & O. Ry.

SOUTHWESTERN FREIGHT BUREAU DOCKET

16157. **Sand**, from Denison, Texas, to Ft. Smith, Ark. To establish rate of 11c per 100 lb. on sand, carloads (See Note 1), except when cars are loaded to actual visible capacity actual weight will govern, but not less than 50,000 lb., from Denison, Texas, to Ft. Smith, Ark. Shippers state that they desire the establishment of a rate which will enable them to compete with other producing points.

SOUTHERN FREIGHT ASSOCIATION DOCKET

42732. **Phosphatic sand** (fertilizer filler), from Florida origins to Paducah, Ky. It is proposed to establish the following reduced rates on phosphatic sand (fertilizer filler), ground or not ground, carloads (See Note 2), to Paducah, Ky.; from Brewster Fla., 480c; Bartow, Fla., 470c; Dunellon, Fla., 430c; Juliette, Fla., 430c, and from Newberry, Fla., 410c per net ton. Made with relation to rates that have been established to southeastern and Carolina points.

41356, Amdt. 1. **Marble, granite and stone, viz.: Stone, crushed, paving or macadam and limestone dust**, from New York, N. Y., to Charlotte, N. C. Submittal No. 41356, included in Docket No. 431, for August 20 hearing, proposed establishment of rate of 32½c per 100 lb. on marble, granite and stone, viz.: Stone, crushed, paving or macadam and limestone dust, carloads (See Note 3), from New York, N. Y., to Charlotte, N. C. Same as current rate to Columbia, S. C. This proposition was withdrawn, but is now reinstated for further consideration.

42674. **Sand and gravel**, from Puddledock and Hopewell, Va., to Thurman and Riverdale, N. C. It is proposed to increase rate of 149c to 160c per net ton on sand and gravel, carloads, as described under Commodity Description Letter "W," Item 1400, Agent Cottrell's I. C. C. 727, from Puddledock and Hopewell, Va., to Thurman and Riverdale, N. C., 160c being the rate from Petersburg, Va., and the rate from all three origins to contiguous destinations.

42794. **Stone, crushed or rubble**, from Boxley, Va., to C. & O. Ry. stations in Virginia. Combination over Richmond, Va., rates now apply. It is proposed to establish rates on stone, crushed or rubble, carloads (See Note 3), from Boxley, Va., to C. & O. Ry. stations in Virginia on basis of the Interstate Commerce Commission's Docket 17517 scale, observing the C. & O. Ry. local scale, applied to the through distances, as minima.

42810. **Calcite** from Sparta, Tenn., to Maitland, O. Lowest combination now applies. Proposed rate on calcite, ground or pulverized (ground or pulverized limestone), carloads (See Note 1), except when car is loaded to full visibile capacity actual weight will apply, from Sparta, Tenn., to Maitland, O., 382c per net ton, same as rate in effect to Springfield, O.

42813. **Calcium carbonate and crushed** or ground **limestone**, addition of, to list of transit ingredients shown in Agent Speiden's I. C. C. 1199. It is proposed to add the commodities mentioned above to Item 15B of Agent Speiden's Freight Tariff 170A, I. C. C. 1199.

TRUNK LINE ASSOCIATION DOCKET

19799. (A) **Building sand**, carloads; (B) **sand, blast, engine, foundry, molding, glass, silica, quartz or silex**, carloads (See Note 2), from Mapleton District, Penn., to York, Penn.; (A) $1.40, (B) $1.53 per net ton. Reason—The proposed rates are comparable with rates now in force from and to points in the same general territory.

19807. **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), from Bacon Hill, North East, Charlestown and Principio, Md., to Lemoyne, Penn., $1.25 per net ton. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

19810. **Crushed stone**, carloads (See Note 2), from Barree, Union Furnace, Tyrone Forge and Stover, Penn., to Williamsport, Penn., $1.25 per net ton. Reason—The proposed rate is fairly comparable with rates from Pond Hill, Penn., to Williamsport and Newberry, Penn.

19815. **Rip-rap or scrap stone**, carloads (See Note 2), from Oxford and Norwich, N. Y., to Albany, N. Y., $1.40 per net ton.

19817. **Refuse limestone, ground**, carloads (See Note 2), from Lime Crest, N. J., to New York Lighterage Station, N. J., $1.30 per net ton. Reason—The proposed rates are fairly comparable with rates on ground limestone from Ogdensburg, N. J., to Weehawken and Edgewater, N. J.

19819. **Stone, natural, crushed,** N. O. I. B. N. in Official Classification, carloads (See Note 2), from Mill Hall, Penn., to Tompkins and Nelson, Penn., $1.25 per net ton. Reason—The proposed rate is comparable with rates on like commodities for like distances, services and conditions.

19820. **Crushed stone,** carloads (See Note 2), from Allentown, Penn., to Pittstown, N. J., 90c per net ton. Reason—The proposed rate is comparable with rates now in force from Easton, Penn., to New Market, Bound Brook and Manville, N. J.

19822. **Crude fluxing limestone,** carloads (See Note 2), from Pleasant Gap and Bellefonte, Penn., to Phillipsdale, R. I., 18½c per 100 lb., to apply only when shipped in open top equipment, except during a period of car shortage, when shipper orders open top equipment and carrier for its convenience furnishes box car account of inability to supply open top equipment, the rates provided for open top equipment will apply. Reason—The proposed rate is fairly comparable with rates on like commodities from Bainbridge, Penn., to Phillipsdale, R. I.

19827. To cancel commodity rate of 13c per 100 lb. on **ground limestone,** carloads, minmium weight 50,000 lb., from Martinsburg, W. Va., and other B. & O. R. R. points of origin named in Item 2725 of Agent Wilson's I. C. C. A193, from which rates are now published to Huntington, W. Va., and N. Y. C. R. R. (O. C. L.) stations, Brosia, W. Va., to Charleston, W. Va., inclusive, group rate of 22c to apply. Reason—Investigation develops that there has been no movement, therefore rates are obsolete.

19828. **Limestone, crude, fluxing, foundry or furnace,** carloads, when shipped in open top equipment (See Note 2), from Stephens City, Va., to Steubenville, O., $1.66, and to Portsmouth, O., $3.16 per gross ton. Reason—Proposed rates are fairly comparable with rates from Martinsburg, W. Va.

19847. To increase rate of 80c to 90c per net ton on **sand** (other than blast, engine, foundry, glass, molding or silica) and **gravel,** carloads (See Note 1), from Phillipsburg, N. J., to Fenstermachers to Longacre, Penn., inclusive. Reason—To place the rate on the proper basis.

19848. **Limestone, ground or pulverized,** carloads, minimum weight 50,000 lb., from Munns, N. Y., to Cooperstown, N. Y., $1.75 per net ton. Reason—The proposed rate is comparable with rate now in force from Jamesville, N. Y., to Cooperstown, N. Y.

19849. **Stone, crushed,** carloads (See Note 2), from Northampton, Penn., to Treichler, Penn., 50c per net ton. Reason—To meet motor truck competition.

19853. To establish the same rates on **stone, chips or waste, natural,** other than bituminous asphalt rock, N. O. I. B. N., in packages or in bulk, minimum weight 40,000 lb., carloads, from Graham, N. Y., to Lackawaxen, Penn., inclusive; Rowlands, Penn., to Honesdale, Penn., inclusive; Lake Ariel, Penn., Mast Hope, Penn., to Gulf Summit, N. Y., inclusive; Lanesboro, Penn., to Carbondale, Penn., inclusive, and Susquehanna, Penn., to Kirkwood, N. Y., inclusive, to all points in C. F. A. territory as are now published on slate, crushed, ground, refuse or scrap, in specific rate group 412 of Agent Wilson's I. C. C. A193, applicable from points named in Note 39 on page 302 thereof, which includes such points of origin as Poultney, Vt., Granville, N. Y., Bangor, Penn., etc. Reason—The proposed rates are comparable with rates on scrap slate from and to points in the same general territory.

WESTERN TRUNK LINE DOCKET

2051HH. **Stone, crushed,** carloads, uniform minimum weight, from Sioux Falls, S. D., to Worthington, Minn. Present, 5½c per 100 lb.; proposed, 4½c per 100 lb.

1038-M. **Sand** (other than blast, engine, foundry, glass, loam, molding or silica), carloads (See Note 2), from Cumberland, Md., to destinations on the Western Maryland and B. & O. R. R. west of Cumberland, Md., in the states of Pennsylvania, Maryland and West Virginia, rates ranging from 60c to $1.90 per net ton. Reason—The proposed rates are fairly comparable with rates on like commodities for like distances, services and conditions.

774-B. **Stone.** Where term "rubble stone" is used, change to read "refuse stone." Between points in W. T. L. territory. Present, Item 675, W. T. L. Rule Circular 1-T authorizes crushed stone rates on "rubble stone," also tariffs of individual lines include "rubble stone" at same rates as on crushed stone. Proposed—Continue crushed stone rates on "refuse stone," but on other stone, apply rates applicable on stone other than broken, crushed or ground, etc.

TRANSCONTINENTAL FREIGHT BUREAU DOCKET

9384. **Dolomite, magnesite,** etc., for export to Hawaiian Island. W. B.: Request for amendment of Item 8810, Tariff 1E (I. C. C. 96, A228, 2216 and 1210 of Frank Van Ummersen, W. S. Curlett, B. T. Jones and H. G. Toll, Agents, respectively), and Item 6310A, Tariff 4A (I. C. C. 86, A217, 2074 and 1203 of Frank Van Ummersen, W. S. Curlett, B. T. Jones and H. G. Toll, Agents, respectively), to include all of the commodities listed in Item 1855 series of the tariffs.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

15659. **Stone, broken or crushed,** in bulk, open cars, carloads (See Note 2), from Branford (Pine Orchard Quarry), East Berlin (Beckleys Quarry), East Haven, East Wallingford (Reeds Gap Quarry), Meriden (York Hill Quarry), Rocky Hill, Conn., to Providence, R. I., $1; from Westfield, Mass., to Providence, R. I., $1.10 per net ton; from Branford, Conn., East Providence, R. I., $1 per net ton. (Rates expire with December 31, 1929, unless sooner canceled, changed or extended.) Reason—To provide for an extension of expiration date on rates to Providence, R. I., and to equalize basis for movement of stone from Branford, Conn., to East Providence, R. I.

ILLINOIS FREIGHT ASSOCIATION DOCKET

4751. **Sand,** all kinds, carloads, from Ottawa, Ill., to Ludington, Mich. Present rate, class; proposed, $2.90.

4753. **Molding sand,** carloads, from Bowes, Ill., to Rock Island, Moline and Canton, Ill., and Davenport, Iowa. Present rate, class; proposed, $2.02 per ton of 2000 lb.

4754. **Crushed stone,** carloads, from Lehigh and Thornton, Ill., to Virginia and Jacksonville, Ill., via I. C. and J. & H. Present rate, $1.22; proposed, $1.13 per ton of 2000 lb.

Returned Empty Cement Sacks

THE Interstate Commerce Commission has dismissed No. 16802, Texas Cement Plaster Co. vs. Abilene & Southern et al., and the cases joined with it, all involving the question of the rates on returned empty cement plaster sacks or returned empty cement bags or sacks. Some of the cases were on further consideration of the reports in 93 I. C. C. 605 and 136 I. C. C. 279.

Summarized, the commission found not unreasonable the rates on returned empty cement plaster sacks, in less than carloads, from points in Arkansas, Kansas, Illinois, Indiana, Iowa, Louisiana, Missouri, Nebraska New Mexico, Oklahoma, Alabama, Georgia, Florida, Kentucky, Mississippi, the Carolinas, and Tennessee to Plasterco, Plasterco Junction and Hamlin, Texas. Upon further consideration, it has modified, in part, the finding in the former report, 93 I. C. C. 605, that the rates on empty returned cement bags and sacks, from Texas points to Ada, Okla., were unreasonable and unduly prejudicial but has dismissed that complaint the same as in the original case. It has affirmed the finding of the former report, 136 I. C. C. 279, that the rates on used, empty, cement bags, returned, in less than carloads, from points in Iowa, Nebraska, Kansas and Missouri, to cement mills in those states were not unreasonable. That finding was also on further consideration.

The cases on further consideration were Oklahoma Portland Cement Co. vs. A. & S. et al., 93 I. C. C. 605, and Atlas Portland Cement Co. vs. Santa Fe et al., 136 I. C. C. 279, and the cases joined with it. Those cases were reopened on the commission's own motion. In the Oklahoma case the commission, by division 3, in 1924, found the fourth class rates applied to the future to the extent they might exceed one-half of fourth class. In the Atlas case, decided in 1927, division 4 found the fourth class rates not unreasonable and dismissed it.

The complainant in No. 16802 asked the commission to prescribe one-half of fourth class as reasonable rates on the empty returned plaster and cement containers, which would be a following of division 3 in its disposition of the Oklahoma Portland Cement case. All the carriers except the Kansas City, Mexico & Orient, the report said, opposed the proposed rates. In support of their opposition, it said, they cited Consolidated Classification Case, 54 I. C. C. 1, decided in 1919, in which the commission said that repeatedly it had approved the cancellation of exceptionally low rates on returned empty used packages or containers, referring in that decision to the earlier case of Empty Carrier Ratings, 46 I. C. C. 520, in which the regulating body found justified the proposal to increase ratings on containers from one-half fourth class to fourth class.

In the Oklahoma case the commission said the carriers offered practically no defense and in accordance with the order in that case the rating and rates were reduced to one-half of fourth class. In the Atlas case, the report said, the question of the reasonableness of the rating of one-half fourth class was discussed in detail.

This report also covers No. 14527, Oklahoma Portland Cement Co. vs. Abilene & Southern et al.; No. 17942, Atlas Portland Cement Co. vs. Santa Fe et al. and three sub-numbers thereunder, Same vs. Same; and a fourth sub-number, Hawkeye Portland Cement Co. et al. vs. Santa Fe et al.; No. 17946, Nebraska Cement Co. vs. Santa Fe et al.; and No. 18687, Missouri Portland Cement Co. vs. Santa Fe et al.—*Traffic World.*

Dewey Portland Opens Fight on Rail Rates

A FIGHT to eliminate unfair competition on the part of rival cement companies through possession of special freight rates is seen by a Davenport, Iowa, paper in the filing before the Interstate Commerce Commission of a complaint by the Dewey Portland Cement Co. in which the commission is asked to prescribe reasonable rates on cement from Davenport to Wisconsin points.

Certain cement companies at present enjoy special rates to Wisconsin and other points served by the Dewey company that are below the scale, according to the latter company's claims. The Dewey company asks that either these companies be charged rates based on the regular scale or that the former be given the same special rates. Complaints charging the same discrimination to points in Minnesota and Illinois have also been filed from the Kansas City office of the Dewey Portland. Cement Co.

I. C. C. Decisions

18630. Sand Case Dismissed. Rates on sand and gravel from Cleves, Ohio, to Dixdam, Ky., not unreasonable and case of L. C. Meyers Co. vs. Southern R. R. dismissed.

Kentucky Rock Asphalt Co.'s Chief Engineer Lost on "Vestris"

WYATT A. BROWNFIELD, Louisville, Ky., was among those lost in the sinking of the Lamport and Holt steamship *Vestris* on November 12.

Mr. Brownfield, who was 41 years old, was born near Tonieville, Hardin county, the son of Mr. and Mrs. Dan Brownfield. He was educated at the Hardin Collegiate Institute in Elizabethtown, later attending the University of Kentucky, where he took a civil engineering course.

Mr. Brownfield was a member of Morrison Lodge, Elliott Council and the Elizabethtown Commandery, Knights Templar, all of Elizabethtown, and Kosair Temple, Louisville.—*Louisville* (Ky.) *Journal.*

Frederick Kent Copeland

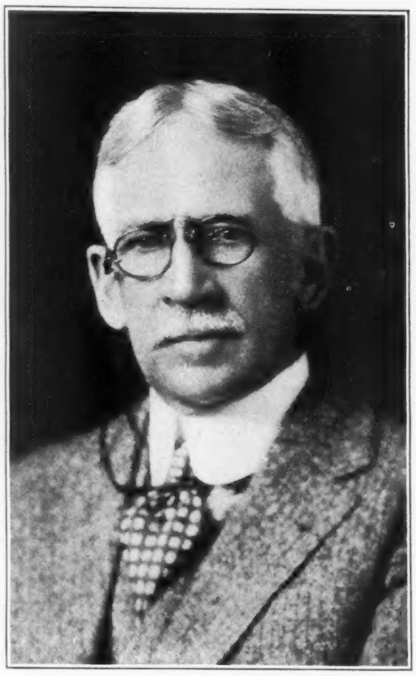
FREDERICK KENT COPELAND, president of the Sullivan Machinery Co. since 1892, died at Claremont, N. H., on Saturday, November 10. He was on a visit to the company's eastern works at Claremont when he was taken ill. It became necessary to operate for appendicitis, death resulting two days later.

Mr. Copeland was born in Lexington, Mass., and was graduated from Massachusetts Institute of Technology in 1876. After several years spent in Iowa and Colorado in mining engineering work, he helped organize the Diamond Prospecting Co. in 1884, and later became its president. This company engaged in contracting with the Diamond core made at Claremont, N. H., by the Sullivan Machine Co. In 1892 the two companies were merged as the Sullivan Machinery Co., with Mr. Copeland as president. Under his leadership the company's products were developed for a wide range of purposes, serving the mining, quarrying and construction industries, manufactured at plants at Claremont, N. H., and Michigan City, Ind., and a world-wide sales organization has been built up.

Mr. Copeland maintained active leadership up to the date of his final illness. He was a member of numerous engineering societies, including the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers and the New York Engineers Club, and of the Bankers Club of New York, and was a past president of the Engineers Club of Chicago, of the Western Society of Engineers and of the National Metal Trades Association. He had served as a trustee of Massachusetts Institute of Technology and, in earlier years, as a member of the village board of Winnetka, Ill., where he made his home for nearly 40 years.

Sevices were held on Sunday, the 11th, at Claremont, attended by the entire personnel of the company's works, and at Mr. Copeland's home in Winnetka, on the 13th. The honorary and active pall bearers included many of his old neighbors, directors of the company, business associates and representatives from the company's plants at Michigan City and Claremont. The company's general offices at Chicago and the plants at Claremont and at Michigan City were closed on the day of the services.

Mr. Copeland combined a great capacity for leadership with an unusual power for grasping and analyzing facts; and with keen foresight, sound judgment and high integrity. His counsel in the industries of which he was a part was often sought and highly valued. He gave unstintingly of his energies to activities and causes that appealed to him. In the recent presidential campaign Mr. Copeland was chairman of the Illinois engineers committee for Herbert Hoover. A telegram received by Mrs. Copeland from Mr. Hoover said: "I am grieved to learn of your husband's death. We have lost a great engineer and friend."


Frederick Kent Copeland

In business Mr. Copeland was a strong individualist, believing that helping other men to help themselves, in an atmosphere of fair play, is the best social and industrial policy. He fostered forward-looking policies in factory conduct and operation, and inspired his associates, both old and young, with loyalty and with belief in his ideals.

A passionate fondness for outdoor things was a dominant note in his entire life. His avocation and his relaxation were gardening, an inheritance from his father, Robert Morris Copeland, a distinguished landscape architect.

In Mr. Copeland's passing the country has lost a pioneer and a builder, the engineering profession a leader of vision and strong purpose and his own company an honored and loved executive.

New San Antonio Sand and Gravel Plant

EARLE L. KNIGHT, formerly general manager of the Springer Transfer Co. of Albuquerque, N. M., has just completed construction of a modern sand and gravel plant near Randolph Field, the new United States air corps training center, San Antonio, Texas, where construction work to cost $30,000,000 will soon be under way. The product of Mr. Knight's new plant has been inspected and approved by the State Highway Department and inspectors from the corps of engineers, War Department of the United States government.

The plant is electrically driven and will turn out between 350 and 400 cu. yd. of sand and gravel a day. It is located at the edge of Schertz and is also at the edge of the new flying field where construction work is expected to be started within the next few weeks.

Mr. Knight has been furnishing sand and gravel for the highway department and government work for several years and has aligned himself with several big contractors in the San Antonio area. If the demand for his material justifies it, he will install other plants as necessary, he said.

The raw product is being taken from a lease of several acres about a half mile from Schertz in a dry river bed and is said to be a very high grade sand and gravel, having been washed for the higher land for a distance of several miles.

The report from the highway department said that the samples sent in had graded up to a high percentage of perfection and that the material was well adapted for use in both highway and construction work.

The company is known as the E. L. Knight Sand and Gravel Co.

Richard L. Humphrey

RICHARD L. HUMPHREY, for many years more or less associated with the portland cement industry, died November 7. He will be remembered by sand, gravel and crushed stone producers as the director of the Building Materials Division of the Council of National Defense during the war, when they met with him as the mineral aggregate committee.

He was a civil engineering graduate of the University of Pennsylvania (1891) and in 1899 was general manager and chief engineer of the Buckhorn Portland Cement Co. Afterward he was a consulting engineer, specializing in the inspection of material and investigation of cement properties. He was prominent in the American Society for Testing Materials, the American Concrete Institute and other scientific societies. At the time of his death he was a member of the Pennsylvania State Registration Board for Professional Engineers.

Cement Products

TRADE MARK REGISTERED WITH U. S PATENT OFFICE

More Aggressive Selling and Planned Advertising Needed in the Products Industry

Philadelphia Shows the Way to the Industry with Its Two New Skyscrapers Built Entirely of Concrete

By M. R. Bowers
Cement Products Bureau, Portland Cement Association

AT the close of the year 1927, numerous forecasts and predictions were made that 1928 would witness the greatest building activity in the history of the country. An analysis of the W. F. Dodge reports for the first nine months of the current year proves these forecasts to have been correct. The reports show $5,472,000,000 worth of construction in the United States at the close of the third quarter, an increase of better than 6% over the same period in 1927. It is only reasonable to believe that the predicted total of $7,000,000,000 for 1928 will be attained, since only $1,528,000,000 of new contracts are needed in this last quarter, a figure considerably lower than was attained in any previous quarter for the year.

What does this huge sum of money spent for new construction mean to the concrete products industry? Although large individual contracts have been let in the industrial, public works and utilities classes, it is noteworthy that the largest increase for the nine months occurred in the residential class. It is the residential and commercial classes of construction that offer the greatest markets for the products manufacturer. Would a careful survey of the products industry reveal a substantial increase in new business in proportion to the general increase of building activity in the country?

The answer to this question will be found among those manufacturers who have been

View showing the construction details of the outer walls of the Integrity Trust Building, Philadelphia, where 8-in. cinder block are used as back-up with 4-in. cinder face brick

In the Integrity Trust Building the walls are of cinder block with the interior columns fireproofed with 3-in solid cinder brick and the exterior walls faced with 4-in. cinder brick

aggressive merchandisers as well as producers. Their plant will be found equipped with salesmen selected with as much or more care than was given to the selection of the machinery with which to produce the block and tile. These salesmen have been trained to cover every possible contact which may result in an increased use of concrete masonry in any type of construction.

An Advertising Program

In addition, these plants have been carrying an aggressive advertising program in which the story of concrete masonry—what it is, what it will do for you, and what its merits are—has been constantly kept before the building public's attention. A great deal of sales resistance has been broken down by these advertising programs. The salesmen have been able to cover a larger field of contacts in a shorter period of time because these contacts were previously informed about concrete masonry. Confidence and knowledge of the quality and value of concrete masonry construction has been built up in the public mind by this co-ordination of advertising and personal selling. As a result these plants have been operating to capacity to meet the demand created by new sales.

Plants of the type mentioned above do exist in all sections of the country. What the industry needs is more plants of the same type in order to reflect an increase of new business in proportion to the continued increase in building activity.

An excellent illustration of what merchandising can do for products manufacturers was developed recently in the city of Philadelphia. Two skyscrapers are being built in that city in which concrete masonry units are being used throughout to the exclusion of a single unit of any competitive masonry material. These structures are the Integrity Trust Building and the Bouvier Apartments, the former a 25-story building in which 350,000 cinder concrete units and 1,000,000 concrete brick will be used, and the latter a 23-story structure employing the use of 165,000 masonry units and 1,150,000 concrete brick in the exterior walls alone.

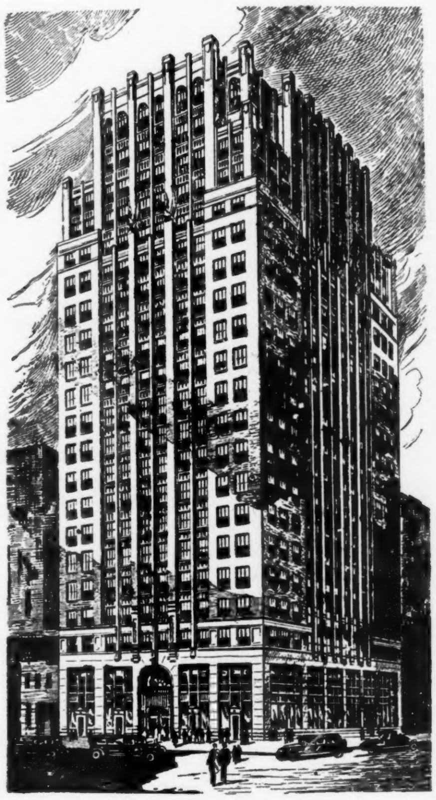
Think what this means to the products manufacturers of Philadelphia and what it should mean to the industry as a whole. For the first time in the history of the building industry a new market of unlimited possibilities has been thrown open to concrete masonry. This is above grade construction "with a vengeance," and there is no reason why Philadelphia plants should not operate at full capacity to meet the demands of this new market.

Such an accomplishment is not a matter of luck—it is the result of hard work and plenty of real merchandising effort. No doubt there will be other skyscrapers in that city which will use concrete masonry when they are built, and again it will not be luck but merchandising that will bring it about. Trained salesmanship and planned advertising will be at the bottom of it.

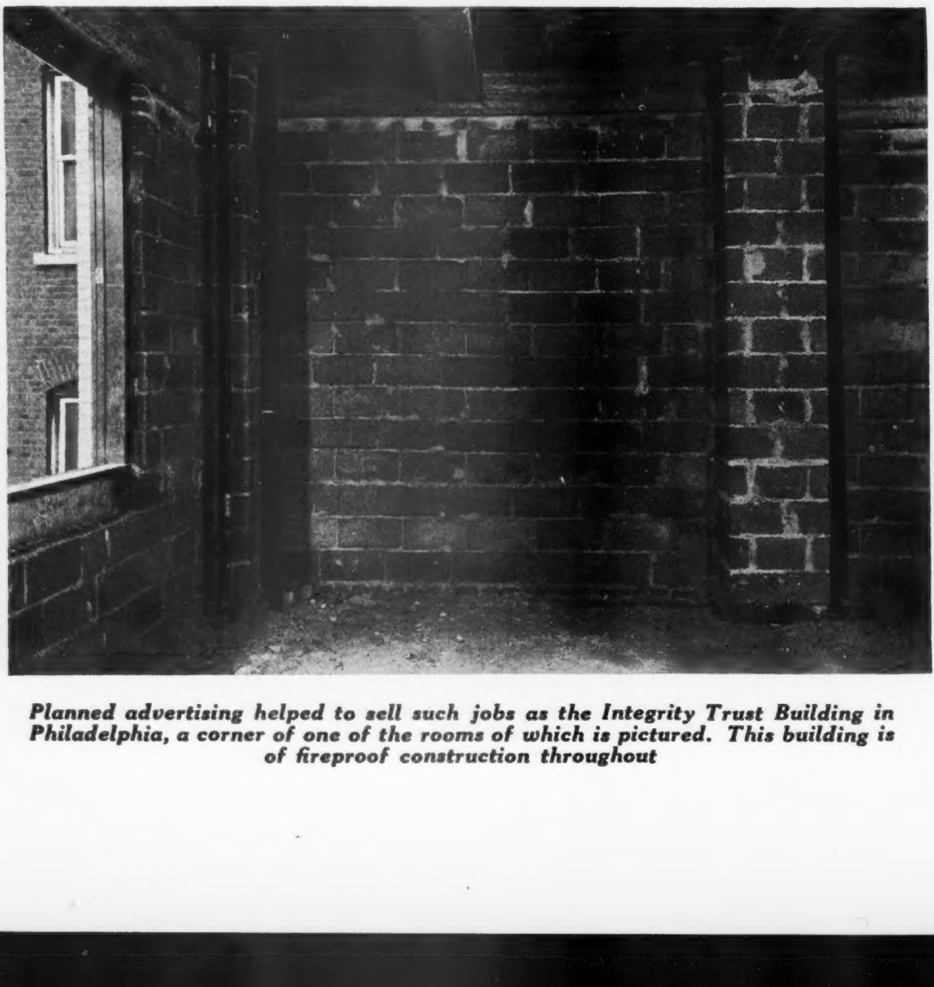
What the Philadelphia Buildings Mean to the Industry

There is another angle to consider in this Philadelphia project. The fact that concrete masonry has been used to the exclusion of all other masonry materials has aroused competitive material interests to a far greater extent than many products manufacturers may realize. These competitors know only too well what it will mean to them in loss of former business, should builders in other large centers follow the lead of Philadelphia. Competition has been keen for a long time now, but it is nothing to what it will be if a few more cities start building their skyscrapers of concrete masonry units.

To meet this competition more plants must employ trained salesmen to sell concrete products. In addition these plants must plan advertising programs that can be consistently and regularly scheduled so that the story of concrete masonry will "register" with the building public. Sales resistance will be broken down by such practice and the salesman can go out and sell concrete block and tile for every type of construction, from bungalow to skyscraper and from foundation to roof. Products manufacturers might take for their slogan, "Remember the Philadelphia Building Projects."



Architect's drawing of the Integrity Trust Building, in which cinder concrete units were used from basement to penthouse, as it will appear when completed



Planned advertising helped to sell such jobs as the Integrity Trust Building in Philadelphia, a corner of one of the rooms of which is pictured. This building is of fireproof construction throughout

Concrete Pipe Men to Meet in Detroit

THE American Concrete Pipe Association will hold its 1929 convention in Detroit the same week as the American Concrete Institute convention. The institute meetings will be held on Tuesday, Wednesday and Thursday, February 12, 13 and 14, while the pipe association will meet on Thursday, Friday and Saturday, February 14, 15 and 16. R. A. Foley of Detroit is president of the Concrete Pipe Association and M. W. Loving of Chicago is secretary.

Ready-Mixed Concrete Plant Completed in Cincinnati

Avril Tru-Batch Concrete Co., Inc., Plant Combines Scientific Control with Inexpensive Operation

A RECENT addition to the rapidly growing list of new ready-mixed concrete plants is the plant of the Avril Tru-Batch Concrete Co., Inc., of Cincinnati, Ohio. The layout, which consists of both storage and batching bins, was designed and fabricated by the Blaw-Knox Co. of Pittsburgh, Penn. The new structure is considered an excellent example of an efficient and modern plant, economical in operation. A. C. Avril, the president and general manager of the Avril Tru-Batch Concrete Co., Inc., in planning the plant had as his object at all times a plant that would be efficient enough to withstand any inspection and produce a concrete mix as "true" to the mix made in a laboratory as possible. This was to be accomplished with ordinary laborers operating the plant and at a minimum labor cost.

There are four circular bins, each 18 ft. in diameter, for storing the aggregates—sand, gravel and crushed stone. Each of these has a capacity of 196 tons. Also there is a bin for cement 15 ft. in diameter with a capacity of 110 tons or 587 bbl. of cement. The use of the aggregate bins for storage, instead of using the "stockpile" method, prevents segregation and as a result maintains the gradation of the aggregates, thus allowing the concrete to be designed on a "fineness modulus" basis. When such a design is used in combination with water cement ratio control, the strength and quality of the concrete is assured. Mr. Avril splits the coarse aggregate into three sizes and in a batch uses a portion of each size. By recombining these separated sizes for the successive batches, any gradation of coarse aggregate may be had.

Batching Bin Equipped with Weighing Devices

The aggregates are conveyed from the four storage bins to the batching bin by a belt conveyor. This batching bin holds 200 tons and is made up of four separate compartments, each of which is equipped with a single weighing batcher. These weighing batchers will weigh to the pound, and each is equipped with a separate scale with its reading beam enclosed in a box. Also each scale is equipped with a dial which weighs the last 200 lb. of each batch, thus insuring that the operator will not overrun, and consequently speeding up the operation.

The cement for the ready-mix plant is delivered in bulk in railroad cars. It is conveyed from the cars to the circular cement bin by an enclosed bucket elevator. The bin has a steel cover and side-discharge bottom hopper. This bin is also equipped with a weighing batcher having a separate scale whose reading beam is enclosed in a box and an auxiliary dial. The batcher discharges to a belt conveyor which carries the cement to the batch hopper at the mixer. The mixer is of 2-yd. capacity.

One of the chief points of interest about the Avril plant is that it does not require expert or skilled labor for its operation. To produce the maximum output of 60 yd. per hour requires only four laborers and one foreman. These men unload the aggregate cars, charge the batching bin, unload the cement cars, batch the aggregates, operate the mixer and load the trucks. Any design of mix can be produced immediately with this force without and delays from batch to batch.

Concrete Stone

THE Association of Cast Stone Manufacturers, organization of which was effected at the time of the A.C.I. convention in Philadelphia last winter, is making progress in lining up the problems which it will try to solve. Progressive manufacturers generally recognize a necessity to bring some order out of chaos by standardization, since there is now far too wide a range of qualities and characteristics in the products, sold under various trade or general names, but all, in the mind of many architects, having some claim on classification as concrete stone. The situation is such that a product claims confidence chiefly through the name and responsibility of its maker and not from any standardization of minimum quality or characteristics. The manufacturers are approaching their problem with the idea that what architects desire of cast stone is that it be durable, that it be permanently good-looking and that it be dependably uniform in quality. Cast stone generally fails in that standing among architects because of numerous instances where it has crazed or cracked, where it has actually disintegrated, where it has discolored badly or where it has a lifeless appearance. While numerous manufacturers have so far overcome the difficulties as to gain a very high place for their product, others, failing to overcome them, bring discredit on the industry. These are conditions which the association proposes to change to put concrete stone in a really dignified place. Committees are now at work to reach this end and reports will be ready for the February convention of the association.

The ready-mixed concrete plant of the Avril Tru-Batch Concrete Co. The aggregate storage bins are at the left, and the batching bin, cement bin and mixer are to the right

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	....	1.30	1.10	1.00	1.00	....
Frederick, Mo.	.50– .75	1.35–1.45	1.15–1.25	1.10–1.20	1.05–1.15	1.05–1.10
Ft. Springs, W. Va.	.40	1.35	1.30	1.25	1.20	....
Munns, N. Y.	.75	1.25	1.25	1.10	1.00	....
Prospect, N. Y.	.85	1.15	1.15	1.15	1.15	....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.75	1.35	1.15	.95	.85	1.20
Walford, Penn.	....	....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	....	....	....	....	.50	1.50
Alton, Ill.	1.85	....	1.85	....	....	....
Columbia and Krause, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	....
Cypress, Ill.	1.00–1.25	1.00–1.25	1.20–1.25	1.20–1.25	1.20–1.25	1.35
Davenport, Iowa (f)	1.00	1.50	1.50	1.30	1.30	1.40
Dubuque, Iowa	.85	1.00	....	1.10	1.10	1.10
Stolle and Falling Springs, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	....
Greencastle, Ind.	1.25	1.05	1.05	1.05	.95	.95
Lannon, Wis.	1.00	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	....	.90–1.00	1.00–1.10	.90–1.00	.85– .90	.85– .90
Northern Ohio points	.85–1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.75	....	1.20	1.10	1.00	....
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Canada (m)	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90–1.20	....	....	1.75	....	1.75
Waukesha, Wis.	1.10	....	.90	.90	.90	.90
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin points	.50	....	1.00	.90	.90	....
Youngstown, Ohio	.70j	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h
SOUTHERN:						
Cartersville, Ga.	1.20	1.65	1.65	1.45	1.15	1.15
Chico, Tex.	1.00–1.40	.50–1.25	1.20	1.10	1.00	.90
Cutler, Fla.	.50– .60r	....	....	1.75r	1.10–1.50r	....
El Paso, Tex.	.50– .75	.50– .75	.50– .75	1.00–1.50	1.00–1.25	.75–1.00
Graystone, Ala.	Crusher run, screened, $1 per ton					
Kendrick and Santos, Fla.	3½ in. and less, $1 per ton					
Olive Hill, Ky.	.50–1.00	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25	....	1.25	1.25	1.00	....
Rock Hill, St. Louis, Mo.	1.00	1.25	1.25	.90–1.25	.90–1.25	.90–1.25
Sugar Creek, Mo.	.75	1.00	1.20	1.20	1.20	1.20

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.75	1.25	1.25	1.25
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	....
Northern New Jersey	1.35–1.45	2.00–2.10	1.80–1.90	1.40–1.50	1.40–1.50	....
Richmond, Calif.	.75	....	1.00	1.00	1.00	....
Spring Valley, Calif.	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25
Springfield, N. J.	1.40	2.00	1.90	1.50	1.50	....
Toronto, Canada (m)	....	5.80	....	4.05	....	....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	....
Cayce, S. C.—Granite	....	....	1.75	1.75	1.60	....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00	....	2.35	....	....	....
Lithonia, Ga.—Granite	.75a	2.00b	1.75	1.40	1.35	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	....
Middlebrook, Mo.	3.00–3.50	....	2.00–2.25	2.00–2.25	....	1.25–3.00
Richmond, Calif.—Quartzite	.75	....	1.00	1.00	1.00	....
Somerset, Penn. (sand-rock)	1.50 to 1.85					
Toccoa, Ga.	1.40	1.40	1.40	1.30	1.25	1.25

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¼ in., 1.35. High calcite fluxing stone, 1.50. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05. (m) Plus .25 per ton for winter delivery. (n) Crusher run for ballast, .85. (p) Carload prices. (q) Crusher run, 1.40; ¼-in. granolithic finish, 3.00. (r) Cubic yard.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 100 mesh	6.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—Analysis, 94.89% $CaCO_3$; 1.5% $MgCO_3$; 50% thru 100 mesh	3.50–5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Cartersville, Ga.—50% thru 50 mesh	1.50
Pulverized, per ton	2.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Cypress, Ill.—Analysis, 88% $CaCO_3$; 10% $MgCO_3$; 50-90% thru 4 mesh	1.25
50-90% thru 100 mesh	1.35
Danbury, Conn., and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; fine ground, 90% thru 100 mesh; bulk	3.50
Paper bags	4.75
100-lb. cloth bags	5.25
(All prices less .25 cash 15 days)	
Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton	6.00
90% thru 20 mesh, bulk, per ton	1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	3.95
Bulk	2.70
Jamesville, N. Y.—Analysis, 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	2.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 42% $MgCO_3$; 50% thru 100 mesh	2.50
90% thru 100 mesh	3.50
Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk	2.70
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk	1.75
Marl—Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk	2.25
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh; bulk, 2.75; paper bags	4.25
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35–1.60
Olive Hill, Ky.—50% thru 4 mesh	1.00
90% thru 100 mesh	2.00
Piqua, Ohio—Total neutralizing power 101.12%; 99% thru 10, 60% thru 50; 45% thru 100	2.50
100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk	3.50
100% thru 4, 30% thru 100, bulk	1.50
Rocky Point, Va.—Analysis, $CaCO_3$, 97%; $MgCO_3$, 75%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1%, $MgCO_3$; 90% thru 10 mesh	1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 50% thru 4 mesh	1.00
Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 10 mesh, per ton	1.25
90% thru 4 mesh, per ton	1.10
Dubuque, Iowa—Analysis, 54.96 $CaCO_3$; 38.82 $MgCO_3$; 50% thru 100 mesh	.85
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Spring, W. Va. — Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.00
Kansas City, Mo.—50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Logansport, Ind.—85% thru 10 mesh, 20% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags	5.00
Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh	1.10–1.70
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.15
Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	1.10–1.70

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks	6.00
Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill.—Analysis, 52% $CaCO_3$; 42% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra)	3.50
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks	4.25
Piqua, Ohio, sacks, 4.50-5.00; bulk	3.00–3.50
Rocky Point, Va.—85% thru 200 mesh, bulk	2.25–3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J.	*1.75–2.25
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Klondike, Mo.	2.00
Massillon, Ohio	3.00
Michigan City, Ind.	.30– .35
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
Rockwood, Mich.	2.25–3.00
San Francisco, Calif.	4.00–5.00
Silica and Mendota, Va.	2.00
St. Louis, Mo.	2.00
Utica and Ottawa, Ill.	.75–1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio	....	1.50
Dresden, Ohio	....	1.25
Eau Claire, Wis.	4.25	1.00
Estill Springs and Sewanee, Tenn.	1.35–1.50	1.35–1.50
Franklin, Penn.	....	1.75
Massillon, Ohio	....	2.00
Michigan City, Ind.	....	.30
Montoursville, Penn.	....	1.25
Ohlton, Ohio	2.00	1.75
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.	....	1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.	....	1.75

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	....	.55	1.10	1.25	1.40	....
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.40	1.40	2.25	....	2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05	1.05	1.05
Erie, Penn.	.60	.85	....	1.25	....	1.25
Leeds Junction, Me.	....	.50	1.75	....	1.25	1.00
Machias Jct., N. Y.	.75	.65	.65	.65	.65	.65
Milton, N. H.	....	.50	....	....	....	.90
Montoursville, Penn.	1.00	.75– .85	1.00	.90	.80	.80
Northern New Jersey	.50– .60	.50– .60	1.25	....	1.35	1.25
Somerset, Penn.	....	2.00	....	....	....	....
South Portland, Me.	....	1.00	2.50	....	2.25	....
Troy, N. Y.	.50– .75*	.50– .75*	.80–1.00*	.80–1.00*	....	.80–1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75	....	1.75
Washington, D. C.	55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.40*	.20*	.20*	.30*	.35*	.40*
Attica, Ind.	All sizes .75–.85					
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.50	.35	.20	.50	.60	.60
Barton, Wis.	....	.40	.60	.65	.65	.65
Chicago, Ill.	.50	.50–1.45n	.60	.60–1.55n	.60	.60–1.90n
Chicago, Ill.	.30	.20	.30	.40	.40	.45
Columbus, Ohio	....	.60	.60	.60	.60	....
Des Moines, Iowa	....	.30	....	1.40	1.50	....
Eau Claire, Chippewa Falls, Wis.	.40	.40	.55	.85	.85	....
Elkhart Lake, Wis.	.60	.40	.60	.55	.45	.45
Ferrysburg, Mich.	....	.50– .80	.60–1.00	.60–1.00	....	.50–1.25
Grand Haven, Mich.	....	.60– .80	.70– .90	.70– .90	....	.70– .90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio	....	1.00	1.00	....	1.00	....
Hersey, Mich.	....	.50	....	....	.70	.70
Humboldt, Iowa	.35	.35	1.35	1.35	1.35	1.35
Indianapolis, Ind.	.60	.60	....	.90	.75–1.00	.75–1.00
Mankato, Minn.	....	.45g	....	.60–1.25h	.70–1.25	1.25c
Mason City, Iowa	....	.50	.85	1.25	1.25	1.25
Mattoon, Ill.	.75–.85 all sizes					
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.35p	.35p	1.25q	1.25q	1.25q	1.25q
St. Louis, Mo.	1.15e	1.45f	1.45a	1.45	1.45	1.45
St. Paul, Minn.	.35	.35	.75	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.85	.75	.75
Waukesha, Wis.	....	.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.10	1.10
SOUTHERN:						
Brewster, Fla.	.50	.50	....	....	....	....
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.	River sand and gravel, all sizes, 1.40					
Eustis, Fla.	....	.45– .50	....	....	....	....
Fort Worth, Tex.	1.00	.90–1.10	1.25	1.00	1.00	1.00
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.00
Macon, Ga.	.65– .90	.65– .90	2.25–2.50	2.25–2.50	2.25–2.50	2.25–2.50
New Martinsville, W. Va.	1.10	1.00	....	1.30	1.10	.90
Roseland, La.	.30	.30	1.00	.95	.70	.70
WESTERN:						
Kansas City, Mo.	.70– .80	.70– .75	....	....	....	....
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10– .40	.10– .40	.50–1.00	.50–1.00	.50–1.00	.50–1.00
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Otay, Calif.	....	.35– .40	.50– .60	.50– .60	.50– .60	.50– .60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.70	.60	....	1.25	....	1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.	....	....	.30	....	....	....
Brookhaven, Miss.	....	....	....	....	....	.60
Buffalo, N. Y.	1.10	.95	....	.85	....	.85
Burnside, Conn.	.75*	....	1.30	1.10	1.00	1.00
Chicago, Ill.	1.25m	....	....	.35	....	....
Des Moines, Iowa	....	....	....	.60	....	....
Dresden, Ohio	....	....	....	.70	.65	....
Eau Claire, Chippewa Falls, Wis.	....	....	....	....	.65	....
Fort Worth, Tex.	....	....	....	....	....	.50r
Gainesville, Tex.	....	....	....	....	.55	....
Grand Rapids, Mich.	....	....	....	.50	....	....
Hamilton, Ohio	....	....	....	....	1.00	....
Hersey, Mich.	....	....	....	.50	....	....
Indianapolis, Ind.	Mixed gravel for concrete work, at .65					
Macon, Ga.	.35	....	....	....	....	....
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Somerset, Penn.	....	1.85–2.00	....	1.50–1.75	....	....
Steilacoom, Wash.	.25	....	....	....	....	....
St. Louis, Mo.	Mine run gravel, 1.55 per ton					
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.40	.40	1.50	1.25	1.10	1.10
York, Penn.	1.10	1.00	....	....	....	....

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) River run. (c) 2½-in. and less. ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Washed and screened river sand. (h) ¾-in. to ¼-in. (j) Lake sand, 1.75, delivered. (k) 60-70% crushed boulders. (m) Cu. yd., dune sand, f.o.b. cars, Chicago. (n) Cu yd., f.o.b. cars, Chicago. (p) .65 cu. yd. (q) $1.75 to $2.00 cu. yd. (r) pit run.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.75	2.65	2.75			4.00	
Beach City, Ohio	1.75–2.00	1.75–2.00		1.50	1.75		
Dresden, Ohio	1.25–1.50	1.25–1.50	1.50–1.75	1.00–1.25			
Eau Claire, Wis.						3.25–4.25	
Elco and Murphysboro, Ill.	Ground silica per ton in carloads—18.00–31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35–1.50	
Franklin, Penn.	1.75–2.25	1.50–1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10–1.50	1.25–2.00	2.00			2.75–3.00	
Klondike, Mo.	2.00			2.00			
Massillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30– .35			
Montoursville, Penn.				1.50–1.60			
New Lexington, Ohio	2.00	1.50					
Ohlton, Ohio	1.75	1.75		2.00	1.75	1.75	
Ottawa, Ill.	1.25	2.25	2.25	2.25	1.25	3.50	2.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	
Silica, Mendota, Va.	Potters flint, 8.00–10.00g						
Utica and Ottawa, Ill.	.40–1.00f	.40–1.00f	.75–1.00	.40–1.00f	.60–1.00f	2.23–3.25	1.00–3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*–2.00h	1.50*–2.00h		1.50*–2.00h			
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, 3.00–4.25. (f) Crude and dry. (g) Also 7.00; building sand, 1.75–2.00. (h) Washed, 1.75.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.00	1.00		1.25			
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.45*	1.45*	1.45*	1.45*	
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.90
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†		.50*		1.15*	.90*	.90*	

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅝ in. to 10 mesh, $1.25*; ⅝ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Lime Ridge, Penn.							5.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.	10.00–11.00	8.50–9.00	8.50–9.00		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50–9.50[7]	8.50–9.50[7]	8.50–10.50[7]	8.00	9.25	7.00	1.40[5]
CENTRAL:								
Afton, Mich.						10.00	7.50	
Carey, Ohio	11.50	7.50	7.50		8.00		8.00	
Cold Springs, Ohio		7.50	7.50				7.00	
Gibsonburg, Ohio	11.50				8.00	10.00		
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Luckey, Ohio	11.50							
Milltown, Ind.		8.50–10.00		10.00[8]			8.50[22]	1.35[10]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Scioto, Ohio	11.50	7.50	7.50	8.50	8.25	.62½	7.00	1.50
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	7.50	7.50	12.50	8.00	10.00[9]	8.00	1.50[3]
SOUTHERN:								
El Paso, Texas							7.00	1.50
Frederick, Md.		8.00–9.50	8.00–9.50			9.50[15]	7.00[15]	
Graystone & Landmark, Ala.	12.50	9.00		12.50			7.00	1.35
Keystone, Ala.	12.50	9.00	9.00	10.00			8.00	1.35
Knoxville, Tenn.	19.00	9.00	9.00	9.00			7.50	1.35
Ocala, Fla.	14.00	11.00	11.00	14.00				.65[10]
WESTERN:								
Kirtland, N. M.							15.00	
Los Angeles, Calif.	15.00	14.00	12.00	18.00			13.50	
San Francisco, Calif.	19.00–19.50	16.00–17.50	12.50–13.70	19.00	13.00[19]	.90[17]	13.00[19]	1.85[17]
Tehachapi, Calif.[18]	10.80		6.75[11]	12.00			10.30	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel; in bbl. .95. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] To 1.50. [11] Refuse or air slack, 10.00–12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] to 1.70. [17] Less credit for return of empties [18] 90-lb. sacks. [19] Also 14.50. [22] To 9.00. [30] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Utica and Ottawa, Ill.	1.00–3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:	
Crude talc (for grinding)	4.00–50.00
Ground talc (20-50 mesh), bags	8.00
Ground talc (150-200 mesh), bags	8.50–15.50
Pencils and steel crayons, gross	1.00– 2.00
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags	7.50–8.50a
Same, including 50-lb. bags	8.50– 9.50
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Cromleys Mt., Md.:	
Crude talc	63.00
Dalton, Ga.:	
Crude talc (for grinding)	4.00
Ground talc (150-200 mesh), bags	9.00
Pencils and steel worker's crayons, per gross	1.00– 2.00
Emeryville, N. Y.:	
(Double air floated) including bags:	
325 mesh	14.75
200 mesh	13.75
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh	15.50–20.00
Henry, Va.:	
Crude (mine run)	3.50– 4.50
Ground talc (150-200 mesh), bags	8.75–14.00
Joliet, Ill.:	
Ground talc (200 mesh) in bags:	
California white	30.00
Southern white	20.00
Illinois talc	10.00
Crude talc	3.75
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00–30.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00–15.00

(a) Bags extra.

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Columbia, Tenn.—B.P.L. 65-70%	3.50– 4.50
Gordonsburg, Tenn.—B.P.L. 65-70%	4.25– 4.75
Mt. Pleasant, Tenn.—B.P.L. 78%	6.50– 6.75
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00– 9.00

Ground Rock
(2000 lb.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 68%	4.00
B.P.L. 72%	4.50
Mt. Pleasant, Tenn.—Lime phosphate: B.P.L. 73% to 75%, 98% thru 100 mesh, bags extra	11.70
80-85% thru 300 mesh, bags extra	11.80
Twomey, Tenn.—B.P.L. 65%	8.00
Wales, Tenn.—B.P.L. 65%	11.00

Florida Phosphate

(Raw Land Pebble)
(Per Ton)

Florida—F.o.b. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

New York City, N. Y.—Per lb.,	
Cut mica (1½x2)	1.60
Cut mica (8x10)	26.00
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	25.00
Mine scrap	22.50–24.00
Roofing mica	37.50
Punch mica, per lb.	.12
Cut mica—50% iron Standard List.	

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, English cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Brighton, Tenn.—Pink marble chips	§3.00	§3.00
Crown Point, N. Y.—Mica spar	....	9.00–10.00
Davenport, Ia.—White limestone, in bags	6.00	6.00
Easton, Penn.	....	8.00– 9.00
Harrisonburg, Va. — Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio — Concrete facings and stucco dash	....	11.00–18.00
Middlebrook, Mo.—Red	....	20.00–25.00
Middlebury, Vt. — Middlebury white	10.00	10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	....	5.50– 7.50
Phillipsburg, N. J.—Royal green granite	....	15.00–18.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Rose pink granite, bulk	....	12.00
Stockton, Calif.—"Nat-rock" roofing grits	....	12.00–20.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	....
Warren, N. H.	....	¶7.90–‖8.95
Wauwatosa, Wis.	....	20.00–32.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00
Whitestone, Ga.	....	*10.00

†C.L.; L.C.L. 16.00. ¶C.L. ‖L.C.L. (a) Including bags. *Per 100 lb.

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140-mesh	19.00
Buckingham, Ore. — White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y. — Color, white; analysis, K_2O, 9.63%; Na_2O, 1.01%; SiO_2, 69.72%; Fe_2O_3, .00%; Al_2O_3, 18.6%; bulk (crude)	9.00
East Hartford, Conn. — Color, white, 40 mesh to 200 mesh	15.00–28.00
East Liverpool, Ohio — Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50–14.00; bulk	11.00–12.50
Pulverized, 95% thru 200 mesh; bags, 19.73–23.50; bulk	15.75–22.50
Pulverized, 20% thru 80 mesh; bags, 17.60; bulk	16.50
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½ thru 200 mesh; bulk (Bags 15c extra.)	18.00
Crude feldspar, bulk	10.00
Tennessee Mills—Color, white; analysis, K_2O, 10%; Na_2O_3, 3%; SiO_2, 68%; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Colo, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50– 8.00

Chicken Grits

Afton, Mich.—(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico and Bridgeport, Tex.	12.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass.—(Limestone)	‡7.50–*9.00
Davenport, Ia.—(Limestone), bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—Per ton, including sacks:	
Feldspar	14.00
Gypsum	7.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton (a)	10.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	8.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, 8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags. (a) F.o.b. Middlebury, Vt.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	10.00
Anaheim, Calif.	10.50–11.00
Barton, Wis.	10.50g
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50–13.50
Detroit, Mich.	13.00–16.00*d
Farmington, Conn.	13.00
Flint, Mich.	18.00†
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00–19.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00–11.00
Lake Helen, Fla.	9.00–12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	12.50–15.00*
Pontiac, Mich.	11.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00–22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas (h)	12.50–13.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (f)	15.00†e
Wilkinson, Fla.	12.00–16.00
Winnipeg, Canada	15.00

*Delivered on job. †5% disc. 10 days. ‖Dealers' price. (a) Less 50c disc. per M, 10th of month. (d) 5% disc., 10th of month. (e) Delivered in city limits. (f) F.o.b. yard, 12.50. (g) Delivered Milwaukee, 13.00. (h) Delivered in city, 14.00–15.00.

Portland Cement

	Per Bag	Per Bbl.	¶"Incor" Perfected High Early Strength
Atlanta, Ga.	....	2.36	3.61
Baltimore, Md.	....	2.25–2.65	3.55
Birmingham, Ala.	....	2.00	3.54
Boston, Mass.	.47	2.33–2.73	3.27
Buffalo, N. Y.	.52½	2.10–2.50	3.40
Butte, Mont.	.90¼	3.61	......
Cedar Rapids, Iowa	....	2.24	......
Charleston, S. C.	....	2.25d	3.58
Cheyenne, Wyo.	.64	2.56	......
Chicago, Ill.	....	2.05–2.45	3.35
Cincinnati, Ohio	....	2.22–2.62	3.52
Cleveland, Ohio	....	2.24–2.64	3.54
Columbus, Ohio	....	2.22–2.62	3.59
Dallas, Texas	....	1.80	3.29
Davenport, Iowa	....	2.24	......
Dayton, Ohio	....	2.24–2.64	3.54
Denver, Colo.	.63¾	2.55	......
Des Moines, Iowa	....	2.14	......
Detroit, Mich.	....	1.95	3.27
Duluth, Minn.	....	2.04	......
Houston, Texas	....	1.90	3.63
Indianapolis, Ind.	.54¾	2.19–2.59	3.39
Jacksonville, Fla.	....	2.60b	3.79
Jersey City, N. J.	....	2.13–2.53	3.43
Kansas City, Mo.	.45½	1.82	3.22
Los Angeles, Calif.	.62½	2.50	......
Louisville, Ky.	.55½	2.57	3.52
Memphis, Tenn.	....	2.04–2.44	3.64
Milwaukee, Wis.	....	2.20–2.60	3.50
Minneapolis, Minn.	....	2.12–2.22	......
Montreal, Que.	....	1.60	......
New Orleans, La.	.45½	1.82	3.61
New York, N. Y.	.50¾	2.03–2.43	3.33
Norfolk, Va.	....	2.07	3.37
Oklahoma City, Okla.	.57¼	2.29	3.69
Omaha, Neb.	.54	2.16	3.56
Peoria, Ill.	....	2.22	......
Philadelphia, Penn.	....	2.21–2.61	3.51
Phoenix, Ariz.	....	3.91*	......
Pittsburgh, Penn.	....	2.04	3.20
Portland, Ore.‡	....	2.30–2.90a	......
Reno, Nev.‡	....	3.41a	......
Richmond, Va.	....	2.40–2.80	3.70
Salt Lake City, Utah	.70¼	2.81	......
San Francisco, Calif.‡	....	2.71a	......
Savannah, Ga.	....	2.60c	3.65
St. Louis, Mo.	.48¾	1.95–2.35	3.25
St. Paul, Minn.	....	2.12–2.22	......
Seattle, Wash.	....	2.65	......
Tampa, Fla.	....	2.40	4.11
Toledo, Ohio	....	2.20–2.60	3.50
Topeka, Kans.	.50¼	2.01	3.66
Tulsa, Okla.	.53¼	2.13	3.53
Wheeling, W. Va.	....	2.12–2.52	......
Winston-Salem, N. C.	....	2.29	3.59

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.	¶"Incor" Perfected High Early Strength
Albany, N. Y.	.43¾	1.75	......
Bellingham, Wash.	....	2.10	......
Buffington, Ind.	....	1.80	......
Chattanooga, Tenn.	....	2.45*	......
Concrete, Wash.	....	2.35	......
Davenport, Calif.	....	2.05	......
Hannibal, Mo.	....	1.90	......
Hudson, N. Y.	....	1.75	......
Leeds, Ala.	....	1.65	......
Lime and Oswego, Ore.	....	2.50‡	......
Mildred, Kan.	....	3.35	......
Nazareth, Penn.	....	2.15	......
Northampton, Penn.	....	1.75	......
Richard City, Tenn.	....	2.05	......
Steelton, Minn.	....	1.85	......
Toledo, Ohio	....	2.20	......
Universal, Penn.	....	1.80	......

NOTE—Add 40c per bbl. for bags. *Includes sacks. †10c disc., 10 days. ‡10c disc., 15 days. (a) Includes cloth sacks returnable at 10c each. (b) 24c bbl. refund for paid freight bill. (c) 35c bbl. refund for paid freight bill. (d) 40c bbl. refund for paid freight bill. ¶prices per bag in paper sacks.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.70	4.00	4.00	4.00	4.00	4.50	....	....	....	....	....	15.00	20.00
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	....	....	....	....	11.70u	....	....	....
Blue Rapids, Kan.	1.70	4.00	....	....	....	....	10.00	....	....	....	....	15.00	20.00
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	....	....	13.50	....	....	....
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	....	....	....	....	14.30o	12.30m	....	m9.00–11.00o	....	....	....	....	....
Delawanna, N. J.	....	....	....	4.50–5.00	13.10–14.00	5.00	....	7.25	....	....	....	....	25.00
Douglas, Ariz.	....	....	6.00	14.50	15.00	....	18.00	....	30.00	....	....	....	....
Fort Dodge, Iowa	1.70	4.00	6.00	9.00	9.00	9.50	....	....	....	19.00	....	15.00	20.00
Grand Rapids, Mich.	2.65	4.00	6.00	6.00	9.00	9.00	17.65	....	22.75	19.00	12.00	15.00	18.00
Gypsum, Ohio	1.70–3.00	4.00	6.00	7.00–9.00	9.00	9.00	19.00	7.00	24.50	19.00	....	15.00	20.00–25.00
Los Angeles, Calif.	4.90	7.50m	7.50m	8.40	9.00	....	10.00	....	36.00u	9.00	19.00	21.00	27.50
Medicine Lodge, Kan.	1.70	4.00	....	....	....	....	....	....	15.00	....	....	15.00	20.00
Oakfield, N. Y.	2.50	....	....	5.50	6.00	6.00	....	5.50	....	....	....	15.00	25.00
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	....	20.00	30.00
Portland, Colo.	....	....	....	10.00	....	....	....	....	....	....	....	....	....
San Francisco, Calif.	....	....	9.00	13.40	14.40	....	15.40	....	....	....	....	....	....
Seattle, Wash. (b)	6.10	10.50	10.50	12.00	13.00	....	....	....	....	....	....	15.00c	22.50
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	....	....	....	....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) Hardwall plaster, 13.00; casting, finishing molding, 14.00; (b) Calacoustic plaster, 10.00 at mill; (c) Plaster lath; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks; (v) retail 35.00.

Market Prices of Cement Products and Slate

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	......	......
Cement City, Mich.		5x8x12–55.00¶	
Chicago District‖	180.00–210.00a	230.00–260.00a	280.00–330.00a
Columbus, Ohio	16.00	......	......
Detroit, Mich.	.15– .17†	......	.24–.26†
Forest Park, Ill.	21.00*	......	......
Grand Rapids, Mich.	15.00*	......	......
Graettinger, Iowa	.18– .20	......	......
Indianapolis, Ind.	.10– .12a	......	......
Los Angeles, Calif.	4x8x12–5.00*	......	......
Olivia and Mankato, Minn.	9.50b	......	......
Somerset, Penn.	.18– .20	......	......
Tiskilwa, Ill.	.16– .18†	......	......
Yakima, Wash.	20.00*	......	......

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain.

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00– 40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00– 50.00
Camden & Trenton, N. J.	17.00	......
Chicago District	14.00	......
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Klinker	10.00	......
Ensley, Ala. ("Slagtex")	9.00–12.00	......
Eugene, Ore.	25.00	35.00– 75.00
Forest Park, Ill.	......	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50– 65.00
Los Angeles, Calif.	12.50	......
Milwaukee, Wis.	14.00	30.00
Mt. Pleasant, N. Y.	......	14.00– 23.00
Omaha, Neb.	18.00	30.00– 40.00
Pasadena, Calif.	10.00	......
Philadelphia, Penn.	14.75	......
Portland, Ore.	17.50	23.00– 55.00
Mantel brick—100.00–150.00		
Prairie du Chien, Wis.	14.00	22.50– 25.00
Rapid City, S. D.	18.00	30.00– 35.00
Waco, Texas	16.50	32.50–125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	......

*40% off List.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened 200 mesh, $7.50 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton.
Granville, N. Y.—Red, green and black, $7.50 per ton.
Pen Argyl, Penn.—Blue grey, $7.50 per ton.

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Oxford gray Buckingham	14.62	18.13	23.40	26.33	32.14	40.95
Bangor, Penn.—No. 1 clear	13.00	22.00	26.00	30.00	40.00	50.00
No. 1 ribbon	9.25	18.00	22.00	26.00	36.00	46.00
Medium clear	9.50	......	......	......	......	......
No. 2 ribbon	6.50	......	......	......	......	......
Chapman Quarries, Penn.—Hard vein	11.25	22.00	26.00	30.00	40.00	50.00
Hard vein medium	9.00	18.00	22.00	26.00	36.00	46.00
Fairhaven, Vt.—						
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Monson, Maine	19.80	24.00	......	......	......	......
Pen Argyl, Penn.—Albion	10.50	22.00	26.00	30.00	40.00	50.00
Albion mediums	9.00	18.00	22.00	26.00	36.00	46.00
Cathedral gray	12.50	22.00	26.00	30.00	40.00	50.00
No. 1 ribbon	8.50	18.00	22.00	26.00	36.00	46.00
Textural	15.00	24.00	30.00	36.00	48.00	60.00
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60
Pasadena, Calif. (Stone Tile):	
3½x4x12, per 100	3.00
3½x6x12, per 100	4.00
3½x8x12, per 100	5.50
Tiskilwa, Ill.;	
8x8, per 100	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	
3½x6x12, per M	50.00
3½x8x12, per M	60.00
Prairie du Chien, Wis.:	
5x8x12, per M	82.00
5x4x12, per M	46.00
5x8x6 (half-tile), per M	41.00
5x8x10 (fractional), per M	82.00
Yakima, Wash. (Building Tile):	Each
5x8x12	.10

Cement Building Tile

Cement City, Mich.:	
5x8x12, per 100	5.00
Chicago District (Haydite):	
4x 8x16, per 100	14.00
8x 8x16, per 100	22.00
8x12x16, per 100	30.00
Columbus, Ohio:	
5x8x12, per 100	6.50
Detroit, Mich.:	
5½x8x12, per M	75.00
Grand Rapids, Mich.:	
5x8x12, per 100	8.00
Longview, Wash.:	
4x6x12, per 100	5.00
4x8x12, per 100	6.25
Mt. Pleasant, N. Y.:	
5x8x12, per M	78.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in.	2.00
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per 100:	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00
Waukesha, Wis.—Drain tile, per ton	8.00

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Detroit, Mich. (c)																	
Sewer	.10	.12	.22	.30	.40	.60	.90	1.20	......	1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert	......	......	......	......	.95	1.25	1.60	......	......	2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich.	4 in. to 12 in., 72% off standard sewer price list; 15 in., 65% off; 18 in. to 24 in., 62% off; 27 in. to 36 in., 60% off																
Houston, Texas	......	.19	.28	.43	.55½	.90	1.30	......	1.70†	2.20	......						......
Indianapolis, Ind. (a)	......	......	......	.75	.85	.90	1.15	......	......	1.60	......	2.50	......	......	......	......	......
Longview, Wash.							Sewer pipe 40% off list; culvert—list										
Mankato, Minn. (b)	......	......	......	......	......	......	......	......	......	1.50	1.75	2.50	3.25	4.25	......	......	......
Newark, N. J.							6 in. to 24 in., 18.00 per ton										
Norfolk, Neb. (b)	......	......	......	.90	1.00	1.13	1.42	......	......	2.11	......	2.75	3.58	......	6.14	......	7.78
Olivia, Mankato, Minn.							12.00 per ton										
Paullina, Iowa‡	......	......	......	......	......	......	......	2.25	......	2.11	......	2.75	3.58	......	6.14	......	7.78
Somerset, Penn.	......	......	......	......	1.08	1.25	1.65	......	......	2.50	......	3.65	4.85	7.50	8.50	......	......
Tiskilwa, Ill. (rein.)	......	......	......	.75	.85	.95	.70	1.55	......	......	......	......	......	......	......	......	......
Tacoma, Wash.	.15	.18	.22½	.30	.40	.60	.85	......	......	......	......	......	......	......	......	......	......
Wahoo, Neb. (b)	......	......	......	......	.95	......	1.27	......	......	2.01	......	2.73	3.78	4.58	6.24	7.19	8.11
Yakima, Wash.	......	......	......	......	......	......	1.42	......	......	2.11	......	2.75	3.58	4.62	6.14	6.96	7.78

(a) 24-in. lengths. (b) Reinforced. (c) Delivered on job; 5% discount, 10th of month. †21-in. diameter. ‡Price per 2-ft. length.

Progress on the Atlas Cement Plant at Waco, Texas

H. E. HARDING, secretary-treasurer of the Atlas Portland Cement Co., New York, was in Waco, Texas, recently, and put in much of his time at the plant site eight miles west of Waco and at the sales office in the Amicable building.

"Things are moving along splendidly and we are sure we have come to the right place with the plant," said Mr. Harding. Contracts for various buildings needed at the big plant will be let at an early date and as fast as they can be reached in the construction program, he thinks.

Footing for the machinery building, which has been located on the left of the McGregor road west of Waco, have been put in by the J. E. Johnson Construction Co. of Waco, and the superstructure will be raised soon, as this building will house many of the implements to be used in erecting various units of the plant. There are many tents on the ground, a few small buildings already are up, one or more artesian wells have been sunk, the huge oil storage tank is rapidly going up and much heavy and permanent fencing has been erected around part of the large tract of land bought. Telephone connection was established very soon after the site was selected. Spur tracks have been put into the plant site, connecting with the Cotton Belt railroad.—*Waco* (Texas) *Times-Herald.*

Southern Sand and Gravel Company in Receivership

FOLLOWING a hearing held November 10, at Greensboro, N. C., before Judge Johnson J. Hayes, in chambers, the receivership of the Southern Sand and Gravel Co. was made permanent. W. R. Williams and Lacy B. Bradshaw were named receivers. The temporary receivers named several weeks ago were Harold J. Gilsdorff and Mr. Bradshaw.

The temporary receivership was granted on petition of Bertrand W. Ward, New York financier, who claimed that he was a bondholder and that the operation of the concern, which has headquarters in Sanford, under the present management was jeopardizing the interests of stockholders and bondholders. In an answer filed, Arthur Lyon claimed that Mr. Ward was trying to make a wreck of the company.

The officials of the Southern Sand and Gravel Co. withdrew all objection to the naming of permanent receivers and both litigating parties agreed on the men to fill these places. It is not known how soon the assets of the concern will be liquidated or whether the receivers will operate it for a while.

A. A. E. Sewell and Clawson Williams, attorneys, of Sanford, appeared for Mr. Lyon, and Brooks, Parker Smith and Wharton represented the petitioner.—*Greensboro* (N. C.) *News.*

Construction of a Monolith Cement Plant in Texas Promised Soon

JUDGE FRED C. ROBERTSON, who has been in charge of the interests and negotiations of the Monolith Portland Cement Co., which is planning a plant on Harbor Island, near Corpus Christi, Texas, has informed Ben Heney of Rockport, Texas, that his company had not only acquired a site on Harbor Island, but had also secured from the state of Texas, by purchase, all the shell reefs in Aransas, Copano and St. Charles bays, thus insuring a raw material supply for a long period of years and sufficient to warrant the required expenditure of millions of dollars for a cement plant.

Further information was to the effect that recent tests at the site on Harbor Island disclosed available foundation at a depth of 30 ft., and that a large force would be actively at work before the end of the year. In fact, construction activity will begin as soon as the Wyoming plant has completed the erection of certain machinery next month, so as to enable the company to send their experienced mechanics and experts to Texas.—*Rockport* (Texas) *Pilot.*

Dewey Cement Company Interested in Community Welfare Work

THE EMPLOYES of the Dewey Portland Cement Co., Dewey, Okla., opened their new association building on November 2.

The opening of this building marks the culmination of one of the most pretentious programs ever attempted by any group of employes of a manufacturing plant in the state. When fully completed the institution will possess gymnasium, showers, games, billards and study rooms.

Night classes have been organized to take up various studies of interest to the employes. The study of music is being developed through an orchestra and a band. All the above facilities are made for the women as well as men.

To foster community spirit the citizens of Dewey have been invited to become members of the association.

A complete schedule of basket, volley and hand ball has been arranged. Wrestling, boxing and other athletic events will be carried on regularly. All athletic events will be under the jurisdiction of a competent athletic director.

The entire project was encouraged and financially assisted by the Dewey Portland Cement Co. as a part of its policy of developing good will between employer and employe. This policy in the past has paid good dividends in the form of an exceptionally low labor turnover, no labor troubles and high workmen efficiency. The company also pays the employes a bonus each year.—*Bartlesville* (Okla.) *Examiner.*

New Type Sand Scow May End Bridge Opening Problem at Chicago

BRIDGE OPENINGS for boats carrying sand, gravel or any other bulk material could be altogether eliminated, it was pointed out recently, if all industrial shippers would adopt the type of vessel now being built by the Smith-Putman Navigation Co. for use on the Chicago river at Chicago, Ill.

The first of the new boats, a 256-ft. craft with a capacity of 2,500 tons of gravel, is under construction at Sturgeon Bay, Wis., and will be completed in February at a cost of $300,000. Although designed to discharge its own cargo, an operation heretofore requiring high fixed deck structures, the new craft will pass beneath all of the 41 bridges in Chicago.

"We realize that, sooner or later, Chicago's bridges are coming down to stay in response to public demands." explained Leathem D. Smith, a partner of Maj. Rufus W. Putnam in the navigation company building the boat. "We have designed this boat expressly to meet that demand. It will prove the contention that materials movement does not necessitate bridge openings."

The new Smith-Putman craft will transport sand and gravel for the Material Service Corp., producer of building materials.

Instead of the high fixed unloading structures which force bridge openings for all sand vessels now in use the Smith-Putman boat carries ringed frames that will be lowered on to the deck when it passes under a bridge.

A second feature of the new boat will be its twin Diesel engines, burning oil and emitting little smoke. Coal burning tugs and lake vessels contribute materially to Chicago's smoke nuisance.

An ordinance is now pending in the city council to lengthen the hours when bridges must remain closed. Should it be adopted, there would be no openings during daylight hours.—*Chicago* (Ill.) *Tribune.*

Russian and Japanese Visitors To Rock Products

DURING the past two weeks ROCK PRODUCTS editors have been visited by three commissioners of the Union of Russian Soviet Republics headed by Sergej Preobragensky, director of silicate industries, and by Hidehiro Inouye, mechanical engineer of the Asano Portland Cement Co., Tokyo, Japan.

Our Russian friends are interested in portland cement and clay industries—particularly slag cement manufacture. Our Japanese reader is particularly interested in quick-hardening portland cement manufacture. His company is now building a new quick-hardening portland cement mill near Tokyo.

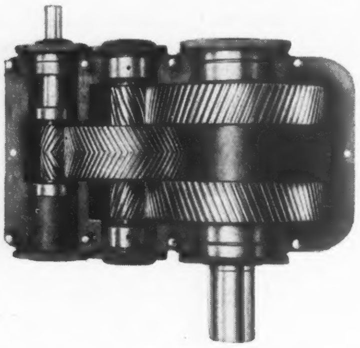
All of them had been studying the development of the cement industry in Europe before coming to this country.

New Machinery and Equipment

New Line of Herringbone Speed Reducers

PALMER-BEE CO., Detroit, has just placed on the market an entirely new line of herringbone speed reducers. This series has been added in order to meet the increasing demand for still stronger, more modern and efficient enclosed gear reduction units, according to the company.

Anti-friction bearings are used throughout—ball bearings on the high speed, Hyatts on the intermediate and Timkens on the slow speed shaft. The gears are continuous-tooth herringbone, with the silent Kysor tooth form, producing more rolling and less sliding action than heretofore has been obtainable, it is claimed. The slow speed gears in the double and triple series are divided in the center, permitting a more symmetrical arrangement of the gearing and a uniform load on each bearing.



Plan view of new herringbone speed reducer

Following the universal practice of the automotive industry in using the three-point method of mounting motors in chassis, the Palmer-Bee Co. has adopted this method in bolting the reducer to the sub-base. Alignment of the various elements of the drive are thus facilitated, it is stated. No outboard bearings are required for overhung loads up to the maximum rated capacity of the reducer. This feature is one of no little importance when the additional expense and inconvenience of including them in certain drive layouts is considered.

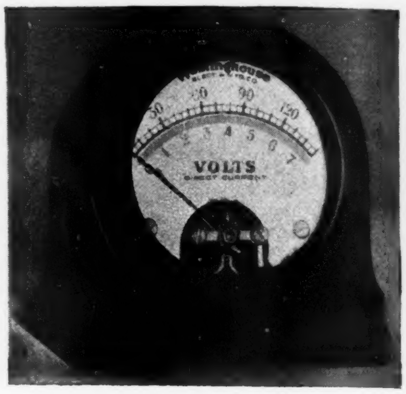
The efficiency of the single series reducers is approximately 99%, and of the double series about 97%, the manufacturers claim.

New Electric Car Spotter

FOOTE BROS. GEAR AND MACHINE CO., Chicago, Chicago, Ill., have recently put on the market a new type electric motor driven car puller, designated as the "IXL Hygrade" car spotter. The reduction unit used in the construction of the new car spotter is the same as the unit used in Foote Bros. "IXL Hygrade" or "8 Hygrade" vertical worm gear reducers. The worm gear is made from chilled cast bronze of a special formula, giving exceptional strength and wearing qualities, it is claimed. The worm is made from nickel steel, carbonized, hardened, ground and polished. High grade ball and roller bearings are used.

The motor is connected to the worm shaft of the car spotter unit through an enclosed spur gear drive which provides part of the reduction. The final reduction for the running speed of the capstan is obtained through the worm and worm gear. All gearing is enclosed in a dust-proof, oil-tight case. Lubrication is obtained by a simple but effective splash system, it is stated.

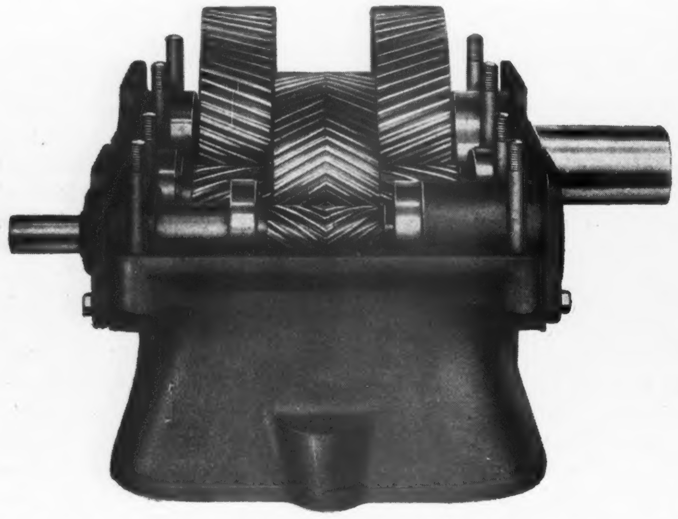
The new car spotter is furnished in two sizes, the smaller, having a rope pull of 3000 lb. and requiring a 5-hp. motor, and the larger having a rope pull of 6000 lb. and requiring a 10-hp. motor. The units are furnished with or without motor, as desired. The base of the car puller unit is provided with cushions for mounting the motor.



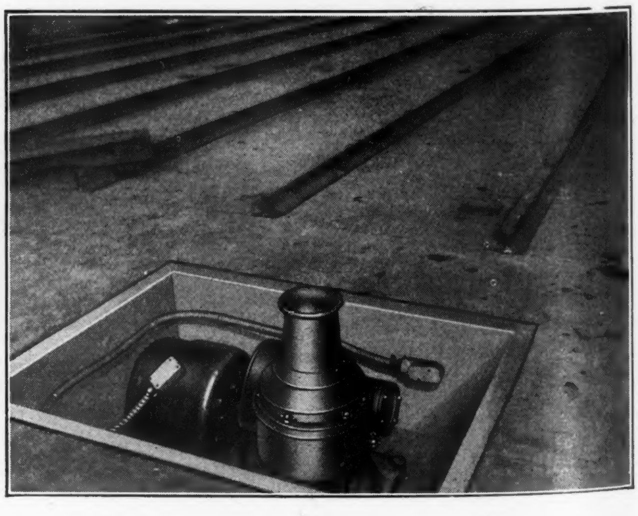
Portable direct current voltmeter

New Portable Direct-Current Instruments

A NEW line of portable direct-current instruments has recently been developed by the Westinghouse Electric and Manufacturing Co. of East Pittsburgh, Penn. These instruments, known as type PX2, are compact and accurate, according to the company's claims. They are of the permanent-magnet, moving coil type and operate on the D'Arsonval principle. Mechanism is mounted on a molded micarta base and has a case of the same material. A mirrored dial and a knife edge pointer facilitate accurate reading. This line of instruments includes millivoltmeters, double-range voltmeters, milliammeters, ammeters and galvanometers.



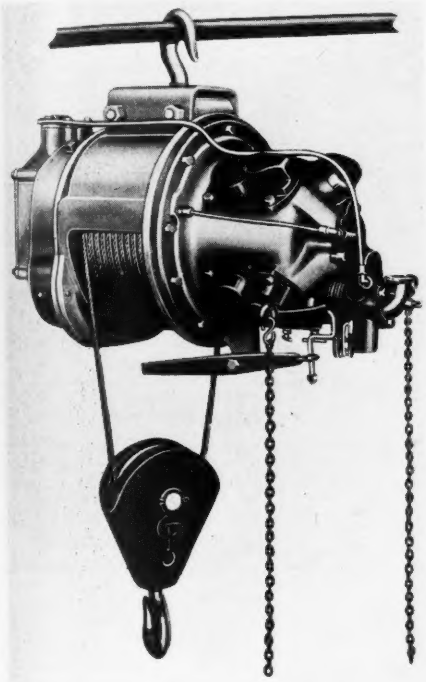
One of the new line of speed reducers with the housing removed



New capstan-type electric car puller

Air Hoists Embody New Features

CHICAGO PNEUMATIC TOOL CO, New York City, announces a line of "CP" air hoists embodying several new and distinctive features. The three sizes now available have a capacity of 2000, 3000 and 4000 lb, respectively, and have an enclosed-



Complete new air hoist

type load block. The motor is four cylinder, single acting and practically vibrationless. Being unusually compact, these hoists require less head room than customarily needed, it is stated. A balanced type control valve assures smooth and positive control, according to the manufacturers. Also the lifting speed has been considerably increased; for example, the 1-ton size will lift 2000 lb. at a speed of 40 ft. per minute. Other features include case hardened steel reduction gears, crank-shaft that runs on large size ball races, brake drum lined with Johns-Manville brake lining and Alemite lubrication.

New Overload Release Sprocket for Bucket Loader

THE BARBER-GREENE CO., Aurora, Ill., has just brought out a new automatic overload release sprocket for its large and small bucket loaders and coal loaders. This release sprocket protects the machine against all strains on the bucket line, and is superior to the "safety breaking bolt" which is the usual method of avoiding strains on such machines, the manufacturers claim.

The sprocket has two main elements, namely, the outside race and the inside springs. The chain runs around the sprocket teeth on the outside of the race. The race itself has two raised parts which are in contact with the two rollers of the springs. The spring part is keyed to the shaft. Ordinarily the pressure of the spring rollers against the raised part of the race is sufficient to make the entire sprocket turn together, thus turning the head shaft and the bucket line. However, when a large boulder or any other big object tends to stop the bucket line, the springs compress, thus allowing the sprocket to run and the head shaft to stand still. Every half revolution thereafter the spring rollers come in contact with the raised parts of the race and force is put on the bucket line. Usually this will free the object causing the trouble and the machine goes on running. If, however, the trouble remains, it is only necessary to remove the rock, and the sprocket is in running position again.

This is practically the same sprocket that has proven successful on the Barber-Greene vertical boom ditcher, and is an improvement over the "safety pin," as it does not hold the machine up even for the length of

Overload release sprocket on a loader

time required to fix a pin. It is a better arrangement than the slipping clutch or belt, the makers claim, as there is no appreciable wear, and the whole power of the machine is put on the bucket line every half revolution after the line is caught. The springs may be quickly adjusted in tension to suit the conditions of the kind of material to be loaded.

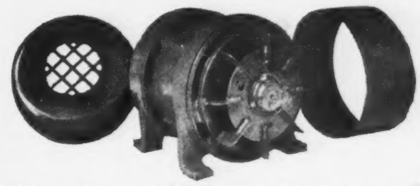
Fan-Cooled, Totally-Enclosed Motor

CLEVELAND ELECTRIC MOTOR CO., Cleveland, Ohio, has placed on the market a new type of totally enclosed, fan-cooled electric motor especially designed to meet exceptionally severe operating conditions. Since the output of any motor is limited largely by the temperature rise, the company has sought to develop circulation through the motor and still have it amply protected from dust. Previous motors, it is stated, have partially accomplished this, but the new type, it is claimed, completely eliminates the possibility of even the smallest dust leakage.

The motor is built with a double shell.

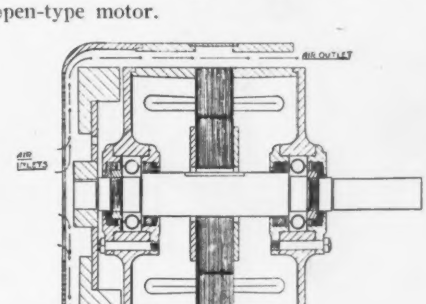
Assembled totally-enclosed, fan-cooled motor showing air space between inner and outer shells

The inner shell, which contains the entire motor, is completely enclosed and entirely dustproof. This inner shell is mounted in the outer shell so as to allow a free air space between them—the shaft passing through both. One end-cover of the outer shell is provided with holes for admitting air. At the end away from the motor pulley, a fan is mounted in the space between the



Motor disassembled showing outer end cover, fan, and enclosing band

inner and outer end-covers. This draws in a steady current of air through the holes mentioned above and blows it over the outer surface of the inner shell. In this manner dust is permanently excluded from the working parts, and yet ample cooling effect is obtained, according to the company's announcement. The manufacturer states that this type of motor permits practically the same rating for a given frame size as an open-type motor.



Sectional view of enclosed motor showing air spaces through which fan forces the air

News of All the Industry

Incorporations

Richmond Granite Corp., Richmond, Va., $50,000. M. L. Clayton.

Genereau and Fanzini, Inc., Auburn Heights, Mich., $20,000. To operate a gravel pit.

Ugo Sand Co., Cleveland, Ohio, $50,000. H. B. Howells, Hildegard L. Burns, and H. E. Michaels.

Panhandle Sand and Gravel Co., Chicago, Ill. Increased capital stock from $200,000 to $300,000.

Builders Supply Co., Hoquiam, Wash., $5000. Harold Stouffer, Jay M. Webb, and Jesse Neeley.

East Hartford Sand Co., East Hartford, Conn. $50,000. Louis Silvestri, and others, all of East Hartford.

Bay Sand and Gravel Corp., Oyster Bay, N. Y. 500 shares, no par value. L. W. Hall, Oyster Bay, correspondent.

Superior Sand and Gravel Co., Denver, Colo., $25,000. Charles W. Edwards, Harry Conway, and Clarence L. Ireland.

Columbia Sand and Gravel Co., Middletown, Ohio, $20,000. J. R. Hunter, John E. Miller, W. C. Stahley, and John W. Bair.

Art Concrete Works, Pasadena, Calif., has filed a petition with the Texas secretary of state making Ralph L. Gates, of Houston, its Texas agent.

Clinton River Washed Sand and Gravel Co., Detroit, Mich., $10,000. To produce sand, gravel and cement blocks. Office, 1717 Dime Bank Bldg., Detroit.

Fauquier Quarries, Inc., Warrentown, Va., $25,000. To purchase, lease, own, develop, mine and quarry stone and rock. John S. Hutton, president, Warrentown.

Southland Gravel Co. of Louisiana, Osyka, Miss., $100,000. To deal in gravel and to operate gravel pits. C. J. Thomas, Osyka, Miss., and S. A. Gano, New Orleans, La.

American Black Gabbro Co., Ashland, Wis. To quarry gabbro stone and minerals and to manufacture them into various products. Julius Effenberger, O. Seestrom and Richard J. Prittie.

Charlotte Stone Co., Charlotte, N. C., $75,000. To mine, quarry, and prepare stone for market, and also other minerals. George H. Moore, Vaughan Hawkins, R. H. Procter, and others, of Charlotte.

Asphalt Corp. of America, 134 N. LaSalle St., Chicago, Ill., $40,000. Manufacture and deal in asphalt, asbestos, etc. William R. Tucker, H. M. Stanford, J. T. Schenck. Correspondent: Golan & Hall, 11 S. LaSalle St., Chicago.

Chicago Art Marble Co. (a Delaware corporation) has filed petition to carry on business in Indiana with capital stock of $1500 represented in that state. To buy, sell, market, acquire, and install marble, marble chips, talc, slate, cement, sand, coloring materials, etc. Indiana agent, Jacob S. White, Merchants Bank Building, Indianapolis.

Sand and Gravel

Minot Colliery Co., Minot, N. D., is installing a power shovel at its sand and gravel plant, west of Minot.

C. F. Lytle Construction Co., Sioux City, Iowa, has purchased a sand and gravel pit a mile south of Correctionville, Iowa.

Bedford and Nugent Sand and Gravel Co., Rockport and Evansville, Ind., is using its floating equipment to help salvage an oil barge which sank near Rockport with 5000 bbl., on November 9.

Crosby Lighterage Co., Seattle, Wash., is constructing sand and gravel bunkers and a ready-mixed concrete plant on block 70, Lake Union shorelands. Clyde Morrow is manager. The project is estimated to cost $25,000. The improvement, as stated by Manager Morrow includes a 10,000-cu. yd. storage bunker, two 2-cu. yd. mixers and a large cement warehouse. The Crosby company owns 700 ft. of waterfront at this location, technically described as waterway No. 6, being situated on Fairview avenue north, north of the Ford assembly plant. This concern, owning gravel pits on Maury island, Hadlock, Washington, and on Whidby island, has been wholesaling sand and gravel for a year and a half and for some time has engaged in the retail trade. Recent jobs supplied include the Northern Life Tower, Bon Marche, Peck and Hills warehouse, West Seattle bridge, the Sand Point hangars and the Valley street paving job. The company owns and operates its own tugboats and barges.

E. T. Slider Co., Louisville, Ky., producers of sand and gravel on the Ohio river at Louisville and New Albany, Ind., on November 8, arranged a special river party for contractors on the company's new all steel towboat, the "C. C. Slider," which was delivered to the company from Pittsburgh the previous Saturday. The boat made a trip of about 40 miles, including the entire journey, and the party inspected the sand dredges at work on the Ohio river up around Grassy Flats. Luncheon and refreshments were served on the boat. The trip required about eight hours in all, it being a nice day's outing.

Edmonds Improvement Co. is the name of a corporation formed by the six Joyce brothers, Edmonds, Wash., for the handling of sand and gravel. Three acres on the waterfront south of the A. M. Yost and Sons lumber yard has been purchased and docks and bunkers will be installed to provide for bringing the materials here by scow. At present the company is furnishing sand and gravel from the beach for the construction of the addition to the Yost Auto Company building on Dayton street. Alfred Joyce is president, Arthur Joyce vice-president, Percy Joyce secretary-treasurer, and Olaf Joyce manager. Other members of the firm are Clarence and Leonard Joyce.

Cement

Valley Forge Cement Co., West Conshohocken, Penn., is installing Western Precipitation Co. dust-collecting apparatus.

Mathieson Alkali Works, Inc., Saltville, Va., is contemplating the erection of a proposed cement mill, possibly during 1929.

Northwestern States Portland Cement Co., Mason City, Iowa, is building a locomotive house. Macdonald Engineering Co., Chicago, Ill., is the contractor.

Pacific Coast Cement Co., Seattle, Wash., entertained the members of the Seattle Engineers' Club at luncheon and on an inspection of the new plant now under construction at Seattle.

Edison Portland Cement Co. will move its New York City offices to the 16th floor of the new 25-story building at 261 Fifth Ave. (29th St.), where all the other Thomas A. Edison Industries will be grouped together.

Sandusky Cement Co., Cleveland, Ohio, has appointed the Edwin A. Machen Co., Cleveland, advertising agency, to direct its advertising account. Magazines, farm papers, business papers, direct-mail and outdoor advertising will be used.

Pacific Coast Cement Co., Seattle, Wash., has let a contract to the Macdonald Engineering Co., Chicago, Ill., for a stock house of approximately 110,000 bbl. storage capacity. There are nine reinforced-concrete silos 24 ft. in diameter by 85 ft. high.

Sandusky Cement Co., York, Penn., has let a contract to the Western Precipitation Co. for the construction of an electrical precipitation installation to cost approximately $100,000, which is guaranteed to capture and return to the kilns 90% of the stack dust.

Keystone Portland Cement Co., Bath, Penn., has purchased the Themos farm, lying west of its new plant. This will add some valuable cement-rock property to the company's present holdings. Within the past month eight new storage silos have been added to the plant and progress is rapid on the installation of equipment to double the plant's capacity.

Canada Cement Co., Ltd., Montreal, Canada, has changed its fiscal year to end November 30 instead of December 31. The chief reasons for the change were given as being that the firm began operating on December 1, 1927, and hence the new date will show the completion of the first full 12 months, and, second, that the inventories of the end of November are the lowest of any month of the year, as all the year's selling is practically over and the next year's reserve has not yet begun to be built up.

Basic Products Co., Pittsburgh, Penn., which will build and operate the portland cement plant on Neville Island, Penn., as a part of the project of the Davison Coke and Chemical Co., as noted in ROCK PRODUCTS, October 13 and 27, 1928. The Macdonald-Spencer Engineering Co., New York City, has been awarded a contract for the plans and engineering of the stockhouse, including plans for all mechanical equipment in the stockhouse, packhouse, island packing station, and barge-loading station. The Macdonald-Spencer Engineering Co. is a part of the Macdonald Engineering Co., Chicago. The Allis-Chalmers Manufacturing Co. will furnish most of the cement-mill equipment. Oliver-United filters will be used to dewater the slurry.

Cement Products

Ready Mix Co., Olympia, Wash., has had an extremely successful year according to reports in local papers, and is contemplating enlarging its facilities.

Newark Concrete Pipe Co., which has a number of plants in New England has acquired a portion of the old quarry property of Brazos Bros. at Portland, Conn., and will establish a plant at that point.

United Concrete Pipe and Tile Co., Los Angeles, has purchased a tract of 15 acres at Torrance, near its present plant, and is contemplating the construction of new works to cost more than $100,000, including equipment.

Lime

M. Mandoni, South San Francisco, Calif., has taken over the lime plant operated in conjunction with the Prest-O-Lite Co., formerly owned by C. I. Chubbick. D. Doherty has been appointed superintendent. Products of the plant include agricultural lime and whitewash.

Southern Mineral Co., Winfield, La., has contracted with the Pineville Gas Co. for the extension of a 6-in. main from Winfield to its lime and stone plant. For the present, gas from this line will be used for the various boilers, forges and other machinery requiring heat, and there is a probability that the lime and cement manufacturing possibilities of the plant will be developed, since gas has been made available, that having been the chief drawback to such an endeavor.

Gypsum

National Gypsum Co., Buffalo, N. Y., has appointed Whipple Bros., Wilkes-Barre, Penn., distributors of its products.

Structural Gypsum Corp., Linden, N. J., has appointed the Tuthill Advertising Agency, Inc., New York City, to direct its publication and direct-mail advertising.

Southwestern Portland Cement Co., El Paso, Tex., is reported to have developed a gypsum quarry and crushing plant at Anthony, N. M., on the Santa Fe railway.

Best Brothers Cement Co., Medicine Lodge, Kan., which has large gypsum products plants at Medicine Lodge and Sun City, Kan., has announced, according to the *Topeka* (Kan.) *Capital*, an expansion program which will increase its output 100%.

Arizona Gypsum Co., Douglas, Ariz., had a long story describing its operation, and its history, in the *Douglas Dispatch* of October 28. The company is celebrating its 25th anniversary. It produces 700 to 800 carloads of gypsum products annually.

Miscellaneous Rock Products

Eureka Flint and Spar Co., Lewis street, Trentoin, N. J., has plans for a plant at Rockingham, Vt. Miscellaneous handling equipment will be required.

United Talc and Crayon Mfg. Co., Glendon, N. C., announce that they will start grinding and shipping talc and soapstone pencils about the first of November.

Dixie Mineral Products Co., Chattanooga, Tenn., W. H. Meachem, 1515 Duncan Ave., president, will proceed with installation of clay mining and refining plant, to cost approximately $75,000 including machinery.

United States Sand Paper Co., manufacturer of abrasive papers and cloths, has purchased assets, good will, formulae, etc., of Federal Abrasive Works, Inc., Westfield, Mass., and Standard Abrasive Co., Inc., Garfield, N. J. Business of two companies will be consolidated and administered under name of Standard Abrasive Co., Inc., with office and factory at Garfield, N. J.

Sand-Lime Brick

Plant City Brick Co. of Plant City, Fla., has resumed operations following an improvement program which included the repairing of old buildings, construction of new buildings and installation of some new and working over of old machinery.

Personals

Jesse J. Caldwell, recently assistant auditor of the Atlas Portland Cement Co., Hannibal, Mo., has been promoted to a managerial position with the company at Waco, Tex.

Fred M. Sackett, of the Louisville Cement Co., J. B. Speed Co., and allied interests, Louisville, Ky., announced recently at Bowling Green, Ky., that he has decided to run for re-election to the United States Senate, at the expiration of his present term in 1931.

Obituaries

Joseph Paul Devine, president of the J. P. Devine Manufacturing Co., Buffalo, N. Y., died recently. He had much to do with the development of chemical process industries both in this country and abroad.

Manufacturers

Cowham Engineering Co., Chicago, Ill., announces that J. L. Nelson has become associated with the company as vice-president and general sales manager.

Thew Shovel Co., Lorain, Ohio, has appointed two new distributors in southern territories—the Southern Tractor Co. of Montgomery, Ala., and the North Carolina Equipment Co. of Raleigh, N. C.

Pennsylvania Pump and Compressor Co., Easton, Penn., has appointed the following sales representatives in Pittsburgh and Boston: J. F. Rodgers, 726 Oliver Bldg., Pittsburgh, Penn., and Gustavo Preston, 113 Broad St., Boston, Mass.

Dorr Co., New York City, announces that A. T. Hastings, who has for several years been manager of the Los Angeles office of the company, sailed for Europe on October 20 to join the Dorr Co., Ltd., of London. A. M. Kivari succeeds Mr. Hastings as manager of the Los Angeles office.

Trackson Co., Milwaukee, Wis., has appointed the Brinker Supply Co., 905 Clark Bldg., Pittsburgh, Penn., and R. L. Stockard and Son, 2302 Charlotte Ave., Nashville, Tenn., as distributors for McCormick-Deering industrial tractors and their lines of related equipment.

Timken Steel and Tube Co., Canton, Ohio, a subsidiary of the Timken Roller Bearing Co., according to reports, has purchased for $200,000 from John C. Schultz, receiver, the Weldless Tube Co., Wooster, Ohio. This plant, built in 1922, has been idle for the last four years, but the new owners expect to place it in operation in the near future.

National Flue Cleaner Co., Inc., Groveville, N. J., has appointed the following three new sales representatives in the Ohio territory: Craun-Liebing Co. of Cleveland, Dennis Engineering Co. of Columbus, and the Bishop Engineering Co. of Cincinnati. Other recent appointments are the Power Plant Efficiency Co. of Indianapolis, Ind., and the Rathburn Co. of El Paso, Tex.

MacDonald Engineering Co., Chicago, Ill., has been given the contract for a stock house to be built at Katskill, N. Y., for the Alpha Portland Cement Co. The stock house will consist of nine circular bins 28 ft. in diameter by 87 ft. high and will have approximately 150,000 bbl. storage capacity.

Prest-O-Lite Co., Inc., New York City, has added a new gas plant to its chain which now numbers 34 acetylene producing plants. The new plant, located at 3155 27th Ave. N., Birmingham, Ala., commenced operations October 16, and will supply the local demand for dissolved acetylene used in oxy-acetylene welding and cutting.

Wagner Electric Corp., St. Louis, Mo., announces the removal of its Los Angeles branch office and service station to larger quarters at 1220 S. Hope St. The removal involves all local departments, including the motor transformer, fan, and hydraulic automobile brake departments, as well as the service station. The company also announces that H. N. Felton, for the past year branch manager of the Milwaukee office, has been made branch manager of the New York office.

Equipment Corporation of America, Chicago, Ill., has purchased all of the equipment used in the construction of the great Conowingo, Ind., dam. This is said to be the largest hydro-electric project of its kind in the world, and the equipment originally cost $1,500,000. It is economically impossible to move the large quantity of Conowingo equipment to their several warehouses and plants so a sales office and shop has been established by the company at Conowingo, Ind.

C. O. Bartlett & Snow Co., Cleveland, Ohio, announce that L. S. Shaffer, formerly general manager of the Byers Machine Co., has joined their organization and will be in charge of the sales and development of the new truck body they are building for the transport of premixed concrete. The sale of this new truck body will be handled outside of the regular Bartlett-Snow sales organization, the present plan being to distribute the product entirely through dealers in contractors' equipment and through manufacturers of motor trucks.

International Nickel Co. directors at a recent meeting agreed to vest directly or through stock ownership the properties of the International Nickel Co. of New Jersey in International Nickel Co. of Canada. The Canadian company is to be recapitalized so that it can exchange one share of 7% cumulative preferred for each share of 6% noncumulative preferred of the New Jersey company and six shares of no par common for each share of common stock of the New Jersey company. International Nickel of Canada, Ltd., has agreed to make these changes subject to the plan being declared operative.

Fairbanks, Morse and Co., Chicago, Ill., announce that John A. Manley has been elected vice-president in charge of sales. Mr. Manley was graduated from Northwestern University in 1911, at which time he entered the sales department of the Republic Tire and Rubber Co. Since then his career has been one of rapid advancement. For the past three years he has been manager of sales development for Fairbanks-Morse, and previous to that time he was manager of accounts for Henri, Hurst and McDonald, advertising agency of Chicago.

J. A. Manley

Timken Roller Bearing Co., Canton, Ohio, will occupy spaces No. 232 and No. 233 at the New York Power Show at the Grand Central Palace. One of the principal features of the company's exhibit will be a mechanical display portraying the used of Timken bearings in all sorts of industrial and automotive equipment. The rest of the exhibit will consist of an assortment of various types of bearings suitable for different applications, among them being a complete railway bearing and mounting, and a bearing of the type used on steel mill roll necks. S. C. Merrill of the company's New York office will be in charge of the exhibit.

Combustion Engineering Corp., New York City, has contracted to furnish all the high pressure steam generating equipment for what is reported will be the largest high pressure steam plant in the world. This is the boiler and power plant which the Philip Carey Manufacturing Co., Cincinnati, Ohio, manufacturers of asbestos and magnesia high pressure steam pipe insulation, etc., is to erect at Lockland, Ohio. The plant will be designed for 1800 lb. steam pressure, the highest ever used in America. All the equipment for this plant will be placed with American manufacturers, except the main engines, which will be furnished by A. Borsig of Berlin, Germany. W. E. S. Dyer, consulting engineer, Philadelphia, Penn., will design and have charge of the construction.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

General Purpose Buckets. Illustrated bulletin describing the company's line of general purpose buckets and special buckets for every type of work. BLAW-KNOX CO., Pittsburgh, Penn.

Cast-to-Shape Air Hardening Alloy Steel. A 44-page illustrated booklet, **No. 11**, describing the characteristics and advantages of "Kimite" and presenting instructions for its use, particularly for making dies, but also for many other uses such as tools, pulverizing blades and similar uses. THE KINITE CORP., Milwaukee, Wis.

High Explosives and Blasting Powder. New 32-page bulletin describing and illustrating the company's various types of explosives and blasting powders, with specification and details of uses. **Blasting Supplies.** New 32-page booklet describing and illustrating accessories for use with all types of explosives supplied by the company. HERCULES POWDER CO., Wilmington, Del.

Pumps, Compressors and Engines for Buildings. New 28-page booklet describing the company's complete line of pumps, air compressors, steam condensers, oil and gas engines and other equipment for installation in power houses, industrial buildings and similar structures, and illustrated with numerous pictures of the equipment and installations. WORTHINGTON PUMP AND MACHINERY CORP., New York City.

Single Roll Crushers. New 16-page announcement, **Bulletin No. 2003**, describing and illustrating the company's new series of "Penn-Lehigh Steelbuilt single roll crushers built with extra heavy construction for heavy duty service particularly in cement rocks, shales, gypsum, etc., and for wet and frozen materials. **Single Roll Crushers for Primary Crushing of Smaller Stones** and for **Secondary Crushing. Bulletin No. 2003.** New bulletin announcing the company's new series of "Pennsteel Steelbuilt" crushers for handling smaller rocks and for secondary crushing. PENNSYLVANIA CRUSHER CO., Philadelphia, Penn.

Boston Sand and Gravel Loses Suit

THE Boston Sand and Gravel Co. on November 17 lost its suit in the United States supreme court against the United States on the question whether the government is liable for interest as a part of damages in an admiralty suit growing out of a collision between a barge of the Boston company and a government tug.

Willshire, Ohio, Quarries May Be Reopened

ENGINEERS for the France Stone Co., Toledo, Ohio, are making soundings on the Old Erie Stone Co.'s property at Willshire, Ohio, seeking to disclose whether or not it will be feasible to re-open the quarry. The quarry was abandoned 16 years ago, and four years ago the entire operating plant was dismantled. Indications thus far are favorable to re-opening the quarry and the installation of a new plant.—*Toledo (Ohio) Blade.*

Germany to Build Russian Cement Plant

A CONTRACT for a cement plant with an annual capacity of 400,000 tons, to be built near Novorosiska in the Ukraine, has been awarded by the Russian government to the Friedrich Krupp A. G.

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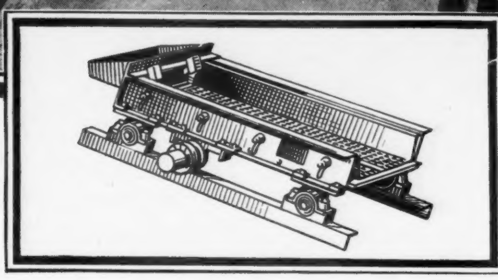

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